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Hydrologic Impacts from Potential Coal Strip Mining - Northern Cheyenne Reservation
Volume II

Northern Cheyenne Research Project
Lame Deer, MT

Prepared for

Industrial Environmental Research Lab.
Cincinnati, OH

Feb 81

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16. ABSTRACT

This volume contains data gathered as part of a grant to the Northern Cheyenne Tribal Council to study potential hydrologic impacts resulting from coal development.

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VOLUME II

by

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Grant R 806082

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FOREWORD

When energy and material resources are extracted, processed, converted, and used, the related pollutional impacts on our environment and even on our health often require that new and increasingly more efficient pollution control methods be used. The Industrial Environmental Research Laboratory, Cincinnati (IERL-Ci) assists in developing and demonstrating new and improved methods that will meet these needs both efficiently and economically.

This report presents the hydrological data collected on the Northern Cheyenne Reservation as part of an investigation designed to answer questions of the Northern Cheyenne Tribe concerning the potential impacts of coal strip mining on the Reservation. This data base has given the tribe the information needed to determine the potential impacts of coal strip mining on the water resources of the Reservation, and to make wise management decisions. The data presented here is also part of a larger effort to assess impacts on the entire Northern Great Plains. For further information, you may contact Jonathan Herrmann of the Energy Pollution Control Divison in Cincinnati.

David G. Stephan
Director
Industrial Environmental Research Laboratory

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ABSTRACT

This research project was initiated with the overall objective of assessing the possible impacts of coal strip mining to the groundwater and surface water resources of the Northern Cheyenne Indian Reservation.

Meteorological, groundwater and surface water monitoring networks were established to evaluate the occurrence, quantity, movement and quality of the region's water resources. Available geologic data were gathered, and field mapping and drilling programs were undertaken to delineate the near surface stratigraphy of the coal bearing Fort Union Formation. Three priority study sites containing strippable coal and representing varied hydrogeologic settings were selected for more detailed study.

Hydrologic data were collected by the Northern Cheyenne Research Project from 1976-1979 on the Northern Cheyenne Reservation as part of a study assessing the potential impacts of energy development on the water resources of the Reservation. This report is a tabulation of the hydrologic data collected. A detailed discussion of the findings of the project are presented in a companion volume to this report. That report covers the period from June 1, 1975 to May 31, 1978.

The hydrologic monitoring network on the Northern Cheyenne Reservation consisted of eight continuous surface water monitoring stations, several monthly surface water monitoring locations, an 81 well groundwater level and quality monitoring network, and five precipitation stations. The hydrologic data collection was funded by the U.S. Environmental Protection Agency (Grants R803566, R806082, P00822801).

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ACKNOWLEDGEMENTS

Special credit goes to former staff members who collected much of the data contained in the report. Bill Woessner and Dan Morales-Brink initiated and collected most of the groundwater data. Wesley Spotted Elk assisted in the collection of the surface water data.

We are appreciative of the assistance given by the entire staff of the Northern Cheyenne Research Project. Special thanks is due Dick Monteau, project director, Ed Heffern, project geologist, and Sharlene Parker, project secretary who coded most of the data contained in this report.

Ho-ho ("thanks" in Cheyenne) goes to Mr. Allen Rowland, President of the Northern Cheyenne Tribe, the Northern Cheyenne Tribal Council and the people of the Reservation for allowing project staff access to conduct research. Their support greatly aided successful completion of this project.

Thanks also is extended to the EPA project officers, John Martin and Jonathan Herrmann, who were very supportive of our efforts.

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CHAPTER 1

INTRODUCTION

The Northern Cheyenne Tribe in 1973 created the Northern Cheyenne Research Project to initiate research to identify existing human, social economic, air, land, and water resources of the Reservation. The Northern Cheyenne Reservation is located in the coal rich Powder River Basin (Figure 1), and the research was initiated to assess the impacts large scale energy development would have on the resources of the Reservation, and to develop for the tribe the information needed to make sage resource management decisions.

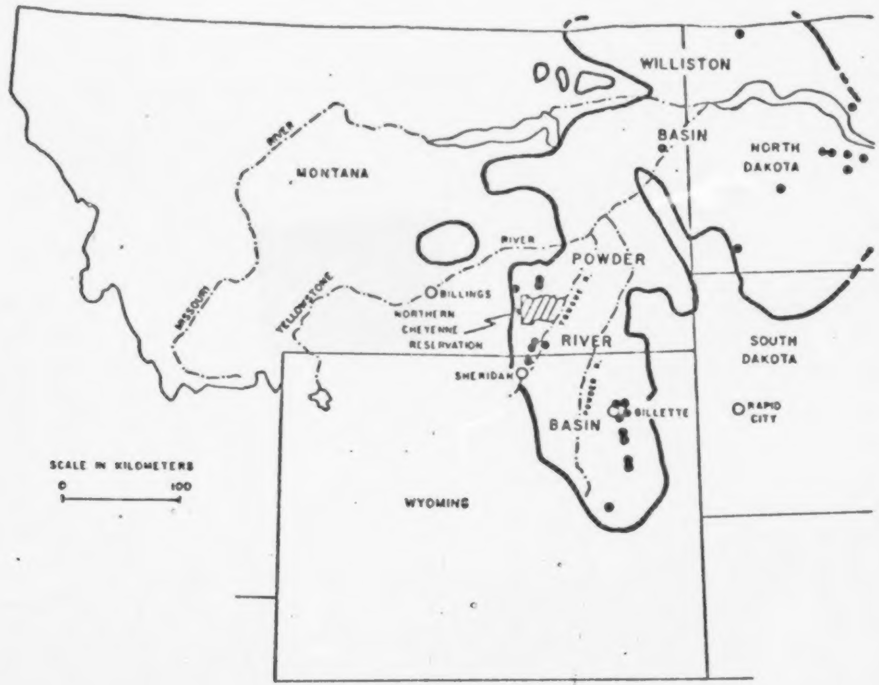
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Figure 1. Location of the Northern Cheyenne Reservation.

Hydrologic research has been an important component of the Northern Cheyenne Research Project. The United States Environmental Protection Agency

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in 1975 awarded the Northern Cheyenne Research Project a three year grant to establish a hydrologic monitoring network on the Reservation, to determine the potential impacts of coal development to the hydrologic systems of the Reservation, and to initiate a comprehensive water management plan. The hydrologic research program received further funding from EPA through a Section 208 Area Wide Waste Water Treatment Management Planning Grant, and a subsequent 18 month grant from EPA to continue the work started in the period 1975-1978.

The results of the hydrologic studies are summarized in Woessner et al. (1980), The Hydrologic Impacts from Potential Coal Strip Mining Northern Cheyenne Reservation; Woessner, Andrews, and Osborne (1979), The Impacts of Coal Strip Mining on the Hydrogeologic System of the Northern Great Plains: Case Study of Potential Impacts on the Northern Cheyenne Reservation; and Osborne (1977), Northern Cheyenne 208 Water Quality Management Report. This report is a collection of the hydrologic data collected during the period 1976-1979. It includes the water quantity and quality data collected at eight surface water monitoring stations, water level and quality data from 81 monitoring wells, and precipitation data from five locations on the Reservation. The data presented here were used to arrive at the conclusions made in previous reports as to potential impacts of strip mining on the Northern Cheyenne Reservation, and to formulate management recommendations. The data also provides detailed information on a large area in the Powder River Basin in which very little hydrologic data were available in the past. This report should be a useful addition to previous tabulations of hydrologic data published by the U.S. Geological Survey for the Powder River Basin (Slagle and Stimson 1979, Lee 1979).

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CHAPTER 2

SURFACE WATER DATA

INTRODUCTION

The Northern Cheyenne Reservation lies within the Yellowstone River sub-basin of the Missouri River. Surface water runoff is directed to two tributaries of the Yellowstone River: Tongue River and Rosebud Creek. The Tongue River is the larger stream with its headwaters in the Bighorn Mountains of Wyoming, while Rosebud Creek is a prairie stream in its entirety.

Two drainages tributary to Tongue River on the Resrvation were monitored: Logging Creek and Cook Creek. Although they do not add appreciably to the flow of Tongue River, they are significant watersheds on the Reservation and are usually perennial. Two tributaries of Rosebud Creek that drain the Reservation were also monitored: Muddy Creek and Lame Deer Creek. They are usually perennial and contribute significant flow to Rosebud Creek.

Several other small streams tributary to Rosebud Creek were monitored monthly or intermittently. These are: Corral Creek, Trail Creek, Thompson Creek, and Davis Creek, and Dry Fork. All but Dry Fork are usually perennial. Corral Creek, Thompson Creek, and Davis Creek all have their headwaters in the Wolf Mountains on the Crow Indian Reservation and join Rosebud Creek on the Northern Cheyenne Reservation.

A map outlining the location of watersheds for which data are presented in this report is presented in Figure 2, and the locations of the gaging sites are shown in Figure 3. A summary of the principal watershed characteristics of drainages on the Northern Cheyenne Reservation is presented in Table 1.

METHODS

The gaging station network on the Reservation included three servo-manometer bubble gages and five stilling wells with float-type systems. Control structures on smaller streams included three trapezoidal weirs and one Parshall flume. Station equipment is summarized in Table 2. The design and operation of gaging stations generally followed the recommendations of the manufacturer and the USGS (Buchanan and Somers, 1968). A record sheet was maintained in each gaging house to note the date and time of visit, inside and outside stage, air temperature, operation of equipment and name of the observer. A seperate field record book was maintained to record the same information plus water quality data and other field observations. Most gaging stations

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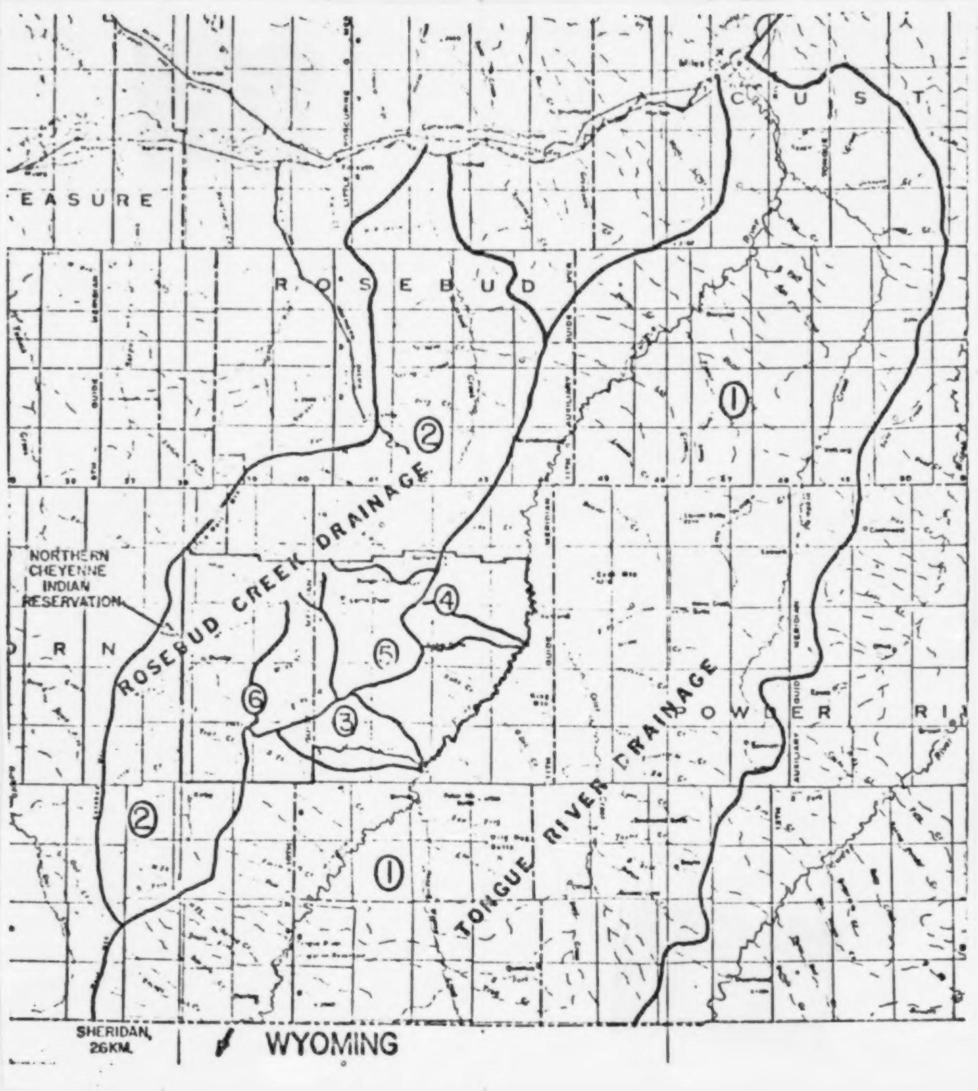
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Figure 2. The drainage basins on the Northern Cheyenne Reservation (basin numbers refer to TABLE 1).

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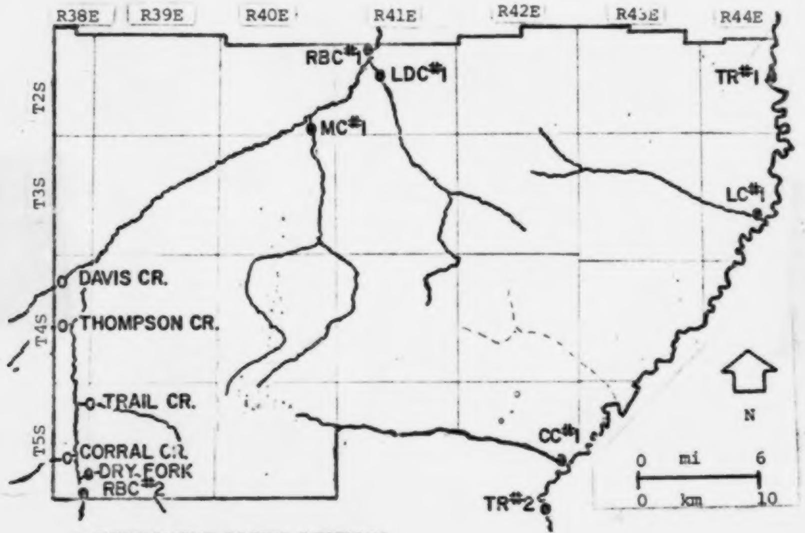
TABLE 1. SUMMARY OF WATERSHED CHARACTERISTICS, NORTHERN CHEYENNE RESERVATION AREA

Map No.	Drainage	Watershed Area Km^2 (mi^2)	Headwaters Elevation m (ft)	Mean Annual Precip. cm (in)	Irrigated Area Km^2 (acres)	Mean Annual Discharge m^3/sec (ft^3/sec)	Dominant Water Source of Stream	Mean Gr.-water discharge rate m^3/sec/r. km (ft^3/sec/r.mi)
1	Tongue River at Miles City	10.107 (3,902)	3900 m (12,000 ft)	30-36 (12-14)	364 (90,000)	12.49 (441)	Surface Water from Bighorn Mountains	0.01 (0.55)
	Tongue River at Stateline	3825 (1,477)		30-63 (12-25)	260 (64,300)	14.47 (511)		
2	Rosebud Creek at Mouth	3,372 (1,302)	1640 (5,000)	30-36 (12-14)	8.09 (2,000)	0.98 (34.6)	Surface Tributaries and ground water	0.001 (0.07)
	Rosebud Creek @ no. Res. Bdry.	1,653 (638)		36-41 (14-16)	122 (300)	0.96 (33,9)		
3	Cook Creek	167 (64.3)	1370 (4,500)	30-41 (12-16)	0.20 (50)	0.03 (1.26)	Groundwater	
4	Logging Creek	98.4 (38)	1280 (4,200)	30-41 (12-16)	0	0.021 (0.73)	Surface run-off and ground water	
5	Muddy Creek	266 (103)	1280-1370 (4200-4500)	36-41 (14-16)	0	0.087 (3.07)	Groundwater	
6	Lame Deer Cr.	212 (81.9)	1280 (4,200)	36-41 (14-16)	0.24 (60)	0.061 (2.17)	Groundwater	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TR#1
MC#1
LC#1
DAVIS CR.
THOMPSON CR.
TRAIL CR.
CORRAL CR.
DRY FORK
RBC#2
CC#1
TR#2
N
0 mi 6
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● PERMANENT GAGING STATIONS
o MISCELLANEOUS STREAMFLOW MEASUREMENT LOCATIONS

Figure 3. Location of streamflow measurement sites, with TR #1 = Tongue River #1, TR #2 = Tongue River #2, LC #1 = Logging Creek #1, CC #1 = Cook Creek #1, RBC #1 = Rosebud Creek #1, RBC #2 = Rosebud Creek #2, LDC #1 = Lame Deer Creek #1, MC #1 = Muddy Creek #1.

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TABLE 2. STREAMFLOW GAGING STRUCTURES ON THE NORTHERN CHEYENNE RESERVATION

STATION	STRUCTURE
Tongue River #2	Gaging shelter and stilling well, Stevens A-71 recorder with float, outside staff gage, cableway.
Tongue River #1	Gaging house, servo-manometer bubble-gage and recorder, outside staff gage, cableway.
Rosebud Creek #2	Gaging house, servo-manometer bubble-gage and recorder, outside staff gage, bridge.
Rosebud Creek #1	Same as Rosebud Creek #2.
Cook Creek #1	Seven foot Cipolletti weir, gaging shelter with stilling well, Stevens A-71 recorder with floater, outside gage.
Logging Creek #1	Three foot parshall flume, gaging shelter with stilling wells, Stevens A-71 recorder with float, outside staff gage.
Lame Deer #1	Same as Cook Creek #1.
Muddy Creek #1	Cement bag trapezoidal weir, gaging shelter with stilling well, Stevens A-71 recorder with float, outside staff gage.

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were visited at least once per month to wind clocks, change charts, and flush intake pipes.

Gaging stations with stilling wells and float systems were winterized by suspending a piece of PVC pipe within the stilling well and adding light-weight oil and fuel oil to the pipe to prevent freeze-up under the float. This procedure was satisfactory during the moderate winter of 1976-77, but did not work well during the cold winter of the following year. Discharge measurements were made under ice cover and used to adjust the stage-discharge curve or used to interpolate daily discharge values when recorder data could not be interpreted. In general, the accuracy of winter discharge records is poorer than for other seasons. Gas bubble gages functioned better during winter for the most part.

Considerable difficulty in establishing stage-discharge relationships was caused by warping and settling of outside cantiliver gages. By 1978, most of the original gages were replaced by ones constructed of steel posts, laminated cross-arms, and wider concrete base pads. The flood of May, 1978 caused considerable damage or destroyed several outside gages and orfice piers. All damage was repaired by October, 1978.

The stream gaging program included monthly current meter measurements at 13 sites during 1976 and 1977. Measurements were made only intermittently during water year 1978 and resumed again on a monthly basis during water years 1979 and 1980. Measurements were more infrequent during the winter and were made more frequently during October and November when repetitive seepage runs were often conducted. On the small streams with flow control structures, current meter measuresments were only made on several occasions to check the rated discharge.

All current meter measurements were made utilizing techniques recommended by the USGS (Carter and Davidson, 1968 and Buchanan and Somers, 1969). Normally, 20 or more sections were measured across the stream channel and most discharge values were accurate to about five percent. Exceptions occurred on very small streams (less than one meter in width) or during winter months if ice conditions limited the number of holes bored. At times, float tests or bucket gaging methods were used to obtain discharge values on small tributaries. River stage measurements were taken concurrently with discharge measurements, and stage- discharge relationships (rating curves) were developed.

Water temperature, specific conductance and occassionally pH were determined in the field for each water quality sampling date. During 1976 and 1977, samples were filtered in the field through a 0.45 micron filter and a portion of each sample was preserved for metals analyses by acidifying with nitric acid. Analyses for 20 standard parameters and 16 trace metals were performed by Energy and Environmental Resource Consultants, Inc., Billings, Montana. Methods of analyses are listed in Appendix B. Results of metals analyses for surface water stations are not included in Appendix A, but are available from the Northern Cheyenne Research Project, Lame Deer, Montana.

The data summary for each gaging station in Appendix A includes a description of the station and more detail concerning the period of record, operational problems and interpretation notes.

All the surface water data for the 1976, 1977 and 1978 water years were collected by Tom Osborne, Wesley Spotted Elk or Bill Woessner. Data for water year 1979 were collected by Tom Osborne, Charles Andrews and Jason Whiteman.

AVAILABLE DATA

The surface water data, including daily discharge, current meter measurements and cross-sectional data, and water quality analyses are presented in Appendix A. A summary of the information available for each station in the monitoring network is tabulated in Table 3. The gaging stations are indentified by the full stream name, ie., Tongue River #1, or by abbreviation using the principal letters, ie., TR#1. The suffix 1 applies to all gaging stations located at the downstream end of a stream reach, and the suffix 2 applies to all stations located at an upstream site.

In general, the surface water data collection periods were from mid-1976 to November, 1977, and from October, 1978 through September, 1979. Little water quality data or discharge data were collected in water year 1978 because of the gap between two separate EPA grants supporting the work. Additional documentation and interpretation of hydrologic data contained in this report for the 1976-1977 period can be found in the report for EPA Grant No. R803566 (Woessner, et al., 1980).

TABLE 3. SUMMARY OF AVAILABLE SURFACE WATER DATA

STATION	DAILY DISCHARGE	MISCELLANEOUS DISCHARGE MEASUREMENTS	FIELD MEASUREMENT DATA	WATER QUALITY
Tongue River #1	79, 78p, 77p	-	79, 78, 77	79i, 77m, 76m
Tongue River @ Ashland	N	79i	79	N
Logging Creek	79, 78p, 77p	-	N	77m, 76m
Cook Creek	79, 78, 77,	-	N	79i, 77m, 76m
Tongue River #2	79, 78p, 77, 76p	-	79, 78, 77, 76	79i, 78i, 77m, 76m
Rosebud Creek #1	79, 78, 77p	-	79, 78, 77, 76	79m, 77m, 76m
Lame Deer Creek #1	78p, 77p	79m, 77m, 76m	79	79m, 77m, 76m
Lame Deer Creek #2	N	N	N	77m, 76m
Muddy Creek	79, 78p	77m, 76m	79m	79m, 77m, 76m
Rosebud Creek @ Busby	N	79i, 78i	N	79i, 76i
Davis Creek	N	79i, 77m, 76m	N	77i, 76i
Thompson Creek	N	79i, 77m, 76m	N	77i
Trail Creek	N	79i, 77m, 76m	N	77i
Corral Creek	N	79i, 77m, 76m	N	77i
Dry Fork Creek	N	79i, 76i	N	N
Rosebud Creek #2	79, 78, 77p	-	79, 78, 77, 76	79m, 77m, 76

Key

79,78,77,76 = Water years 1979, 1978, 1977, 1976
P = Partial daily record
N = No data
i = Intermittent measurements
m = Monthly measurements
- = Not applicable

CHAPTER 3

GROUNDWATER DATA

INTRODUCTION

The hydrogeologic monitoring network was designed to identify and characterize the near surface groundwater flow systems on the Reservation. The stratigraphy on the Reservation is listed in Table 4. Groundwater studies were limited to defining and characterizing flow systems within the Paleocene Tongue River Member of the Fort Union Formation, and in the Quaternary alluvium. The Tongue River Member, a sequence of laterally discontinuous fine sandstones, siltstones, silty shales and waxy shales, separated by fairly continuous coal seams, covers most of the Reservation (Figure 4). The coals of the Tongue River Member have locally burned and have baked and hardened the overburden into extensive clinker deposits. Quaternary alluvium fills the major stream valleys, often to depths of over 30 meters.

METHODS

Domestic water well logs, and water quality reports available in 1975 from the Northern Cheyenne Housing Authority and Indian Health Service were evaluated and a 57 well monitoring network was designed, constructed, and operated. The monitoring program was extended to 81 wells by the fall of 1976 (Figure 5). Thirty of the network wells were existing wells, and 51 were constructed by the NCRP to provide data in areas without available monitoring points. Wells were selected and desinged to provide accurate data on the hydrostatic head, degree of confinement, annual changes in storage, horizontal and vertical gradients, and hydrogeologic parameters of aquifers. The wells were also used to obtain water samples for quality analyses from various water bearing strata. In addition to the 81 well monitoring network, an extensive hydrogeologic inventory catalogued 208 domestic wells and springs.

Wells were constructed at 45 sites using 10.2 cm inner diameter PVC casing and at six sites using 3.8 cm inner diameter PVC casing. Originally, well design included the placement of cement in the bottom of the hole to seal off the underlying strata. This practice was abandoned when cement contamination was noticed in water samples from those wells. All later wells were gravel packed from the bottom to about 2 meters above the perforations (Figure 6).

Water levels in the network wells were monitored monthly with a steel tape. Water quality samples were pumped or bailed quarterly from 61 of the 81 wells. Temperature, specific conductance, and pH were determined in the

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TABLE 4. STRATIGRAPHY OF THE NORTHERN CHEYENNE RESERVATION

SYSTEM	SERIES	THICKNESS M (FT)	FORMATION (MEMBER)	DEP. ENV.	LITHOLOGY
Quaternary		0-37(0-120)		Fluvial	Alluvium
		0-70(0-230)			Clinker
Tertiary	Pliocene to Miocene	Thin veneer	Flaxville		Lag gravels on high plateaus
	Eocene	0-31(0-100)	Wasatch		Shale, sandstone, coal
	Paleocene	61-519 (200-1700)	Fort Union (Tongue River)		Shale, siltstone, massive sandstone, thick coal
		122(400)	(Lebo Shale)		Dark shale, minor sandstone
		244(800)	(Tullock)		Shale, sandstone, minor coal
Cretaceous	Upper Cretaceous	61(200)	Hell Creek		Sandstone, shale
		235(770)	Bearpaw	Marine	Shale
		55(180)	Judith River		Sandstone, shale
		104(340)	Claggett		Shale
		210(690)	Eagle-Telegraph Creek		Sandstone, sandy shale
		265(870)	Niobrara		Limy shale
		88(290)	Greenhorn		Shale
		95(310)	Graneros		Shale
		122(400)	Mowry-Thermopolis		Shale, upper part silty and glauconitic
	Lower Cretaceous	21(70)	Newcastle		Sandstone, shale
		27(90)	Skull Creek		Shale
		40(130)	Basal Colorado		Sandstone, siltstone
		24(80)	Dakota	Fluvial to Strand	Sandstone, shale
		43(140)	Fuson		Sandstone, claystone
		21(70)	Lakota		Claystone
Jurassic		34(110)	Morrison		Shale, sandstone
		82(270)	Swift	Strand to Marine	Glauconitic to limy sandstone
		49(160)	Rierdon		Limy shale, limestone
		12(40)	Bowes		Shale
		37(120)	Undivided		Limestone, anhydrite, dolomite
Triassic to Permian		43(140)	Spearfish/Chugwater		Reddish dolomitic silty shale
		31(100)	Goose Egg		Dolomitic silty shale, anhydrite
Carboniferous	Pennsylvanian	27(90)	Tensleep	Marine	Sandstone, dolomite
		27(90)	Amsden		Cherty dolomite
	Mississippian	235(770)	Madison		Massive dolomite and limestone
		116(380)	Lodgepole		Limestone, dolomite
Devonian		43(140)	Undivided		Massive dolomite
Silurian		24(80)	Interlake		Massive dolomite
Ordovician		95(310)	Red River		Massive dolomite
		18(60)	Winnipeg		Sandstone
Cambrian		12(40)	Undivided		Limestone
Pre-Cambrian		?	Undivided	Igneous and Metamorphic	Gabbro and other basement rocks

*Data were assembled from Superior Oil Co. Well No. 22-19, Thom et al, (1935), and NCRP field work.

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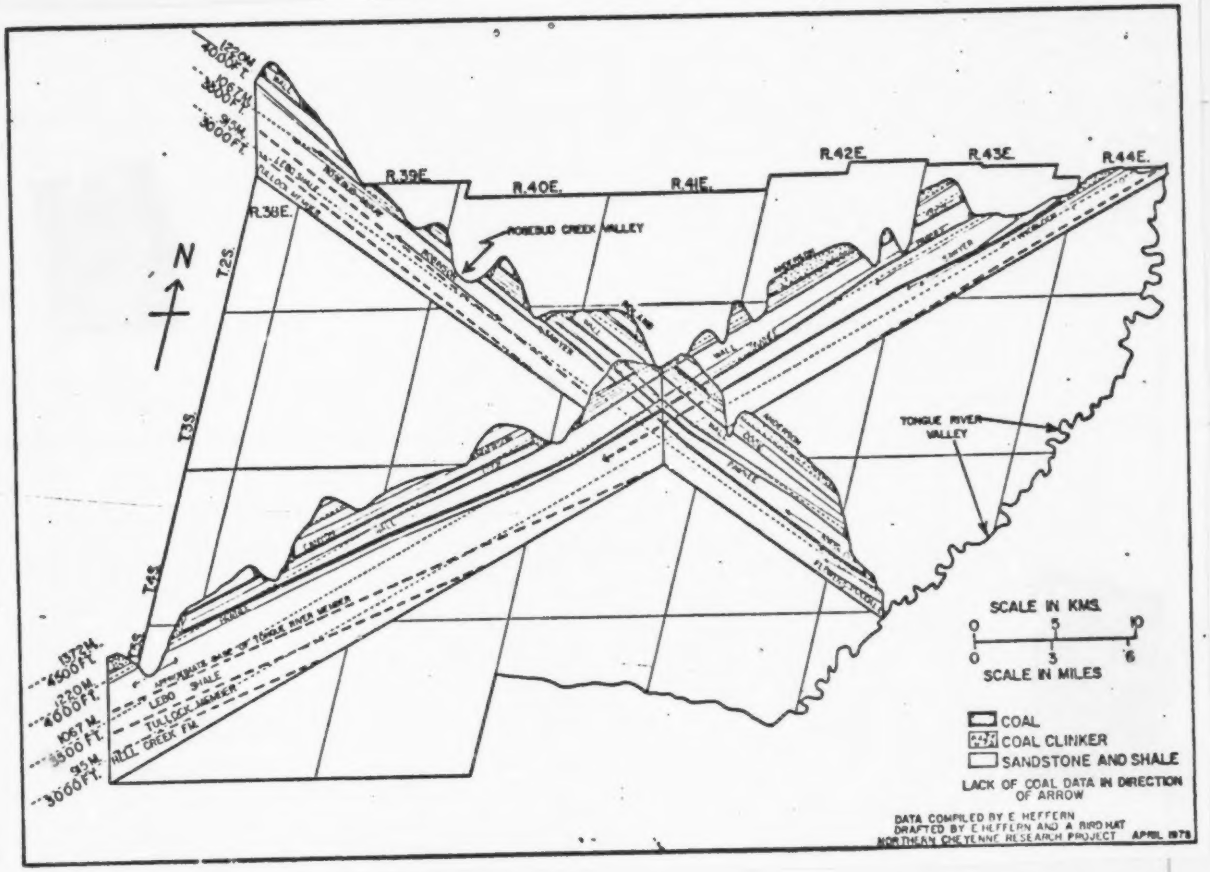
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1067M. 3500FT.
915M. 3000FT.
1372M. 4500FT.
1220M. 4000FT.
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R.38E.
R.39E.
R.40E.
R.41E.
R.42E.
R.43E.
R.44E.
T.2S.
T.3S.
T.4S.
T.5S.
N
ROSEBUD CREEK VALLEY
TONGUE RIVER VALLEY
APPROXIMATE BASE OF TONGUE RIVER MEMBER
LEBO SHALE
TULLOCK MEMBER
HELL CREEK FM.
SCALE IN KMS.
0
5
10
0
3
6
SCALE IN MILES
COAL
COAL CLINKER
SANDSTONE AND SHALE
LACK OF COAL DATA IN DIRECTION OF ARROW
DATA COMPILED BY E. HEFFERN
DRAFTED BY E. HEFFERN AND A. BIRD HAT
NORTHERN CHEYENNE RESEARCH PROJECT
APRIL 1978

Figure 4. Generalized cross-section, Tongue River Member, Ft. Union Formation, Northern Cheyenne Reservation.

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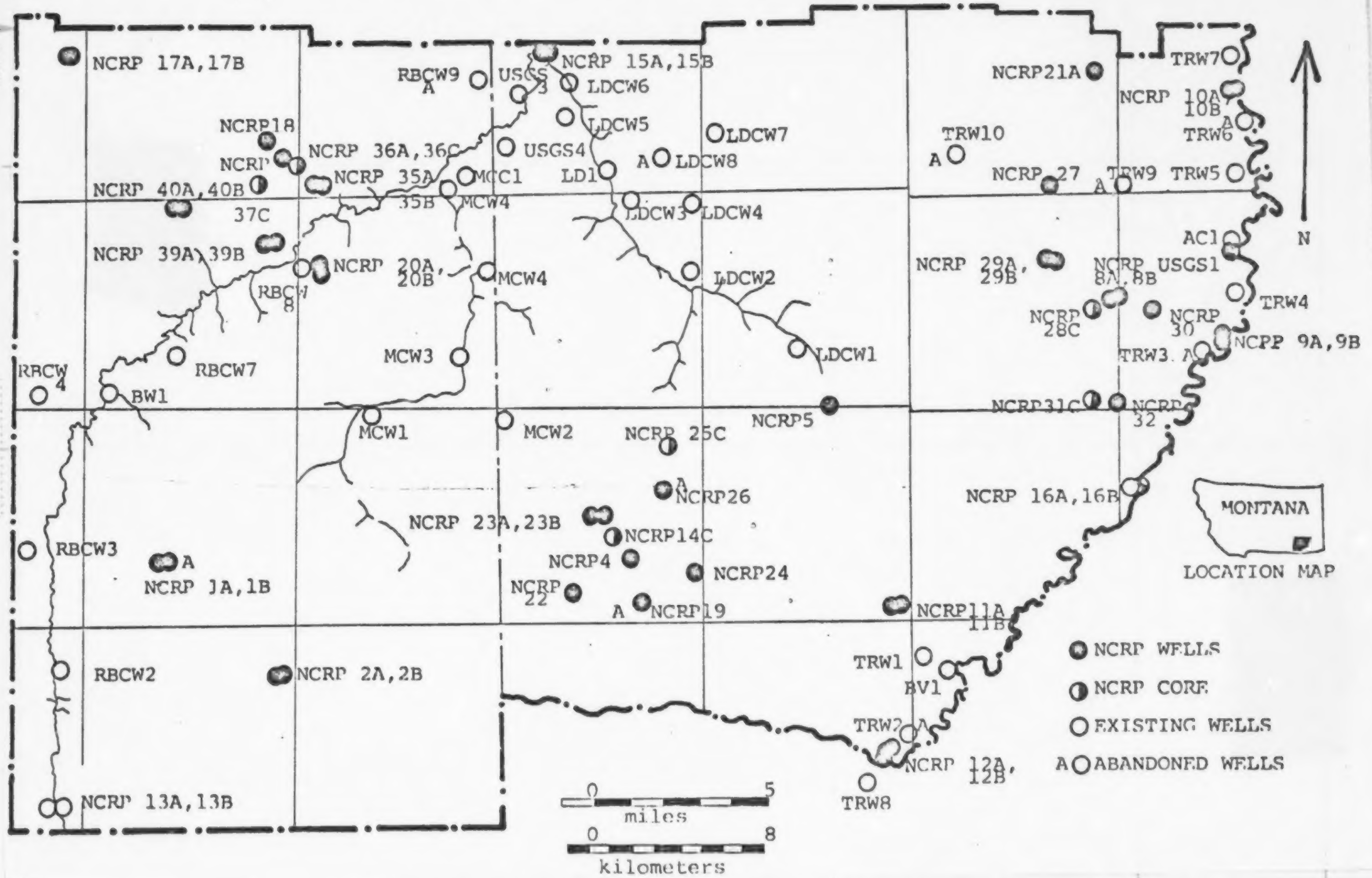
N
NCRP 17A,17B
RBCW9
A
USGS
3
NCRP 15A,15B
LDCW6
LDCW5
LDCW7
NCRP21A
TRW7
NCRP 10A,
10B
A
TRW6
NCRP18
NCRP
NCRP 36A,36C
USGS4
A
LDCW8
LD1
TRW10
A
NCRP 27
A
TRW9
TRW5
NCRP 40A,40B
37C
NCRP 35A
35B
MCC1
MCW4
LDCW3
LDCW4
AC1
NCRP 39A,39B
RBCW
8
NCRP 20A,
20B
MCW4
LDCW2
NCRP 29A,
29B
NCRP USGS1
8A,8B
TRW4
NCRP
28C
NCRP
30
NCRP 9A,9B
RBCW7
MCW3
LDCW1
TRW3
A
RBCW
4
BW1
MCW1
MCW2
NCRP 25C
NCRP5
NCRP31C
NCRP
32
A
NCRP26
NCRP 16A,16B
MONTANA
LOCATION MAP
NCRP 23A,23B
NCRP14C
RBCW3
A
NCRP 1A,1B
NCRP4
NCRP24
NCRP
22
A
NCRP19
NCRP11A
11B
NCRP WELLS
NCRP CORE
EXISTING WELLS
A ABANDONED WELLS
RBCW2
NCRP 2A,2B
TRW1
BV1
TRW2
A
NCRP 12A,
12B
TRW8
NCRP 13A,13B
0
5
miles
0
8
kilometers

Figure 5. Location of wells in groundwater monitoring network.

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field for each sample. Samples were filtered in the field through a 0.45 micron filter and a portion of each sample was preserved for metals analyses by acidifying it with nitric acid. Analyses for 20 standard parameters and 16 trace metals were performed by Energy and Environmental Resource Consultants, Inc., Billings, Montana. Methods of analyses are listed in Appendix B.

All the groundwater data were collected during the period 1975-1978 by Bill Woessner and Dan Morales-Brink.

AVAILABLE DATA

The groundwater data collected from the monitoring well network, water level, water quality, well logs, and pump test data, are tabulated in Appendix B. The data available for each of the wells in the monitoring network are listed in Table 5. The well names have no special significance, except that when wells are nested the suffix A references the deeper well and the suffix B the shallower well, and the suffix C is used to denote wells drilled in conjuction with a stratigraphic coring program. The spatial location of each of the wells is shown in Figure 5, and is described in Appendix B. Appendix B also contains a list of the major springs on the Reservation, and a water quality analyses from each of these springs.

In addition to the data tabulated in Appendix B, other hydrogeologic data were collected by the Northern Cheyenne Research Project. These data include a tabulation of all domestic wells and the Reservation, and water quality analyses for most of the domestic wells. These data are available for inspection by appointment at the Northern Cheyenne Research Project Offices, Lame Deer, Montana 59043.

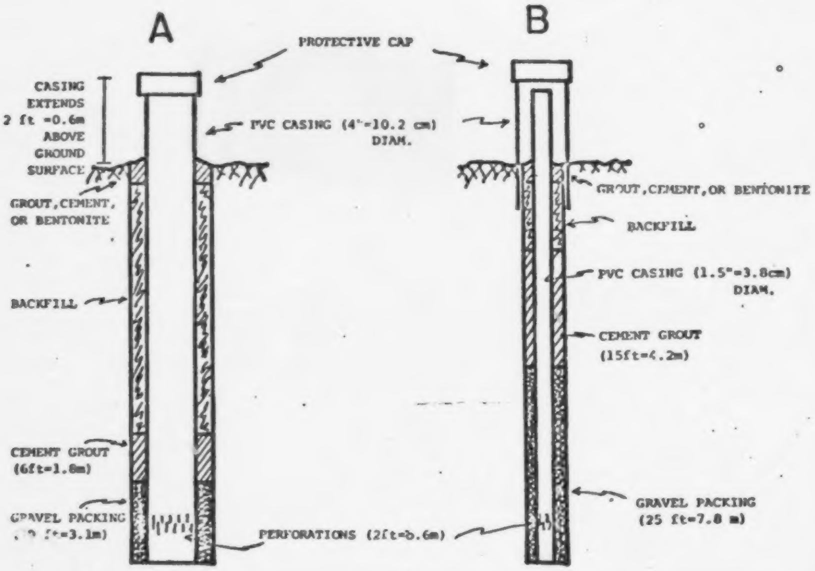
A
B
PROTECTIVE CAP
CASING EXTENDS 2 ft =0.6m ABOVE GROUND SURFACE
PVC CASING (4"=10.2 cm) DIAM.
GROUT, CEMENT, OR BENTONITE
BACKFILL
CEMENT GROUT (6ft=1.8m)
GRAVEL PACKING (10 ft=3.1m)
PERFORATIONS (2ft=0.6m)
GROUT, CEMENT, OR BENTONITE
BACKFILL
PVC CASING (1.5"=3.8cm) DIAM.
CEMENT GROUT (15ft=4.2m)
GRAVEL PACKING (25 ft=7.8 m)

Figure 6. Monitoring well design.

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TABLE 5. SUMMARY OF AVAILABLE GROUNDWATER DATA

WELL	LOCATION	LOG	LEVEL DATA	WATER QUALITY	PUMP DATA
NCRP 1A	BJ	X	76-77	X	
NCRP 1B	BJ	X	76	X	
NCRP 2A	BJ	X	76	X	
NCRP 2B	BJ	X	76	X	
NCRP 4	BJ	X	76	X	X
NCRP 5	LDV	X	76	X	X
NCRP 8A	TRV	X	76	X	X
NCRP 8B	TRV	X	76	X	
NCRP 9A	TRV	X	76	X	
NCRP 9B	TRV	X	76	X	
NCRP 10A	TRV	X	75	X	X
NCRP 10B	TRV	X	75	X	
NCRP 11A	TRV	X	76	X	
NCRP 11B	TRV	X	76	X	
NCRP 12A	TRV	X	76	X	
NCRP 12B	TRV	X	76	X	
NCRP 13A	RCV		76	X	
NCRP 13B	RCV		76	X	
NCRP 14C	BJ		76		
NCRP 15A	RCV	X	76	X	
NCRP 15B	RCV	X	76	X	
NCRP 16A	TRV	X		X	
NCRP 16B	TRV	X	76	X	
NCRP 17A	IC	X			
NCRP 17B	IC	X	76		
NCRP 18	IC	X	76	X	X
NCRP 19	BJ	X			
NCRP 20A	RCV	X	76	X	X
NCRP 20B	RCV	X	76	X	
NCRP 21	TRV	X	76	X	X
NCRP 22	BJ	X	76	X	X
NCRP 23A	BJ	X	76	X	
NCRP 23B	BJ	X	76	X	
NCRP 24	BJ	X	76	X	X
NCRP 25C	BJ		76		
NCRP 26	BJ	X	76	X	
NCRP 27	TRV	X	76	X	
NCRP 28C	TRV	X	79		
NCRP 29A	TRV	X	76	X	X
NCRP 29B	TRV	X	76	X	
NCRP 30A	TRV	X	76	X	X
NCRP 31C	TRV	X	76		
NCRP 32	TRV	X	76	X	
NCRP 35A	IC	X	76	X	X
NCRP 35B	IC	X	76	X	
NCRP 36A	IC	X	76	X	
NCRP 36C	IC		76		
NCRP 37C	IC			plugged with betonite	

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TABLE 5 (cont.)

WELL	LOCATION	LOG	LEVEL DATA	WATER QUALITY	PUMP DATA
NCRP 39A	IC	X	76	X	
NCRP 39B	IC	X	76	X	
NCRP 40A	IC	X	76	X	X
NCRP 40B	IC	X	76	X	
RBCW 2	RCV		76	X	
RBCW 3	RCV				
RBCW 4	RCV		76	X	
RBCW 7	RCV		76		
RBCW 8	RCV		76	X	
RBCW 9	RCV			X	
RBCW 10	RCV				
LCCW 1	LDV		76	X	
LCCW 2	LDV		76	X	
LCCW 3	LDV		76	X	
LCCW 4	LDV		76	X	
LCCW 5	LDV		76	X	
LCCW 6	LDV		76	X	
LCCW 7	LDV		76	X	
LCCW 8	LDV				
USGS 1	TRV		76		
USGS 3	RCV		76		
MCW 1	MUD		76	X	
MCW 2	MUD		76	X	
MCW 3	MUD		76	X	
MCW 4	MUD		76	X	
MCW 5	MUD		76	X	
TRW 1	TRV				
TRW 2	TRV				
TRW 3	TRV			X	
TRW 4	TRV				
TRW 5	TRV		75	X	
TRW 6	TRV				
TRW 7	TRV		75	X	
TRW 8	TRV		75		
TRW 9	TRV				
TRW 10					

NOTES:

Wells RBCW 9, RBCW 10, TRW 1, TRW 2, TRW 9, TRW 10 were to be apart of the monitoring network, but had to abandoned after a short time because of access problems. NCRP 1A was vandalized, a piece of tape fell in NCRP 17A, NCRP 19 collapsed, NCRP 26 was always dry, RBCW #3 melted in a fire, and TRW#6 was rendered inaccessible due to a watch dog.

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CHAPTER 4
METEOROLOGY DATA

Climatalogical data collection included the establishment of four continuous recording precipitation weighing gages in the winter of 1976, two Class A evaporation pans in mid-summer 1976, and the operation of the Lame Deer NOAA station since April, 1978. The locations of the stations are shown in Figure 7. The data collected at these sites is tabulated in Appendix C.

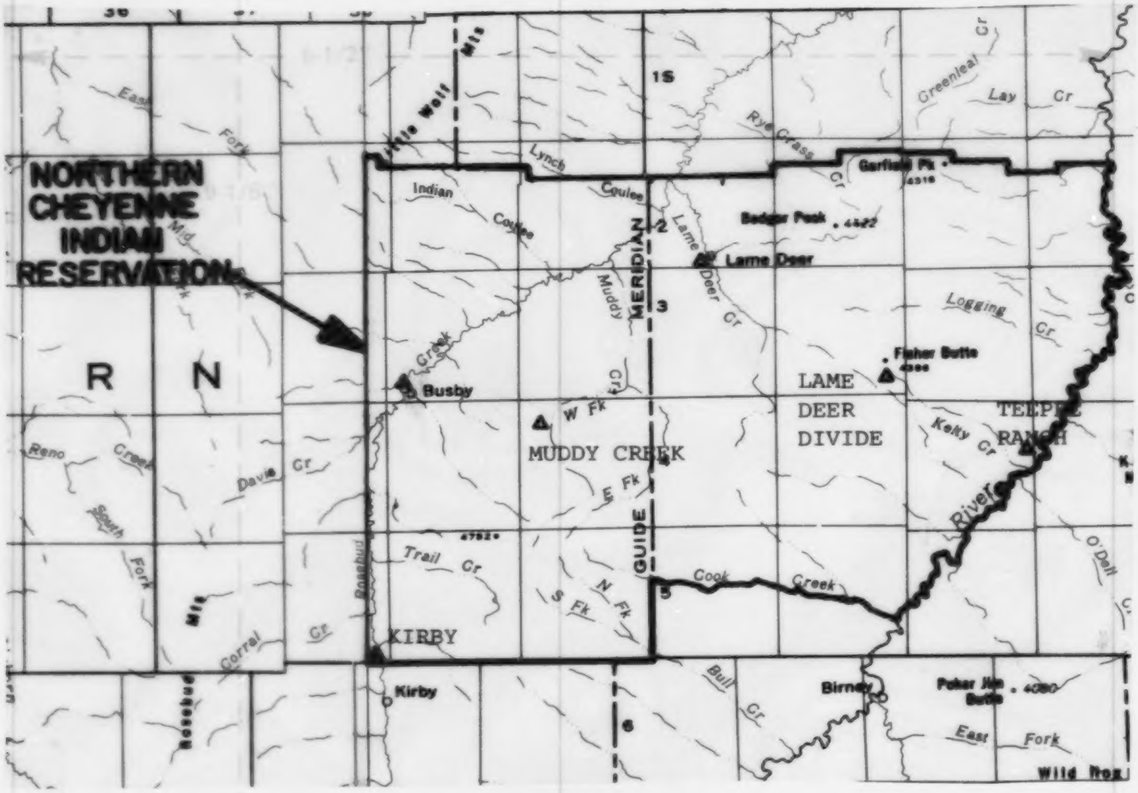
NORTHERN CHEYENNE INDIAN RESERVATION
R
N
Little Wolf Mts
1S
2
3
5
6
Lynch Coulee
Indian Coulee
Rye Grass Cr
Greenleaf Cr
Lay Cr
Garfield Pk 4316
Badger Peak 4422
Lame Deer
Lame Deer Cr
Muddy Cr
MERIDIAN
GUIDE
Logging Cr
Fisher Butte 4366
Busby
W Fk
MUDDY CREEK
E Fk
LAME DEER DIVIDE
Kelty Cr
TEEPEE RANCH
River
O'Dell
Reno Creek
South Fork
Davis Cr
Trail Cr
S Fk
N Fk
Cook Creek
Corral Cr
Rosebud
KIRBY
Kirby
Bull Cr
Birney
Poker Jim Butte 4080
East Fork
Wild Hog

Figure 7. Location of precipitation stations.

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APPENDIX A

SURFACE WATER DATA

EXPLANATORY NOTES

The surface water data appendix is organized by gaging station, in downstream to upstream order, including tributaries. Tongue River basin stations are presented first, followed by Rosebud Creek basin stations.

Data for the principal gaging stations are presented in the following order:

- Station description sheet for water year 1979
- Daily discharge data for water year 1979
- Repeat of first two sheets for each water year of daily record
- Miscellaneous discharge measurement notes starting with water year 1979
- Water quality tabulations starting with earliest data.

Data for the small streams and miscellaneous measurement sites are presented with a single station description sheet, followed in order by daily discharge tabulations, miscellaneous discharge measurements if any, and water quality data.

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TONGUE RIVER #1 AT THE NORTHERN RESERVATION LINE -- WATER YEAR 1979

STATION DESCRIPTION

Gaging house, servo-manometer bubble gage, Leopold Stevens A-71 recorder, outside cantilever staff gage, and a cableway. The station is located in SW 1/4 NW 1/4, Section 22, T. 2 S., R. 44 E., on the left bank on the Northern Cheyenne Reservation at river mile 104.5.

PERIOD OF OPERATION

June 1977 to the present year.

STAGE DISCHARGE CURVE

The stage discharge relationship used was defined by measurements taken since the flood of May 1978. The relationship changed significantly during the May flood. The stage discharge relationship is concave upward and was approximated by two linear sections. The relationship is well defined between 100 and 1800 cfs.

For flows less than 375 cfs, the following relationship defined by four measurements was used:

$$\log(Q) = \log(\text{stage})*3.66105 + 3.431 \quad r=0.995$$

For flows greater than 375 cfs, the following relationship defined by eight measurements was used:

$$\log(Q) = \log(\text{stage})*2.43425 + 4.24655 \quad r=0.998.$$

MALFUNCTIONS AND MISSING RECORDS

Manometer did not respond to stage changes during the period December 21 to January 22 and during the period April 28 to May 14.

Stage records are also missing for the period October 1 to October 12 when the manometer was not operating. The orifice and staff gage were dislocated during the May flood, and were not replaced until October 13,1978.

Records are also missing for the period August 1 to September 11 when the clock was not working.

INTERPRETATION NOTES

The winter flow of the river was regulated by releases from the Tongue River Dam. Because of the thick ice cover during the winter, it was not possible to accurately calculate daily discharges from the stage levels. Daily discharges were calculated from a relationship developed from the known pattern of dam releases, four discharge measurements taken by the USGS below the dam during the winter, five discharge measurements taken at Tongue River #2, five discharge measurements taken at this station, and the changes in stage. Linear interpolation was used between known points.

During the spring thaw, March 4 to March 21, discharges were computed from a stage discharge relationship developed from two measurements taken during March. Linear interpolation was used during the period March 21 to March 25 when large leads developed in the river.

During the other periods of missing record, daily flows were estimated on the basis of flow at Tongue River #2.

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TONGUE RIVER #1

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	400	165	342	337	288	266	373	290	1557	594	440	510
2	400	165	403	335	288	266	364	304	1557	600	440	510
3	400	165	464	332	287	266	359	294	1579	606	440	510
4	400	162	526	330	286	266	349	357	1505	600	430	510
5	400	158	526	328	285	266	349	400	1464	541	430	510
6	400	158	526	326	284	266	349	416	1287	519	430	510
7	400	158	526	324	284	285	343	418	1231	519	430	510
8	400	158	526	321	283	420	343	429	1221	513	430	510
9	400	152	526	319	282	540	343	441	1231	513	430	510
10	250	152	526	317	281	390	343	443	1212	519	430	500
11	225	152	526	315	280	345	343	450	1167	445	430	470
12	195	152	526	313	280	340	343	451	1080	420	430	445
13	195	152	494	310	279	410	343	453	856	440	430	445
14	194	152	463	308	278	383	343	559	643	430	430	445
15	189	152	432	306	277	345	343	541	594	435	430	445
16	181	152	401	304	276	340	343	536	576	430	430	440
17	181	152	370	302	276	290	343	530	565	425	430	377
18	181	152	367	300	275	301	343	530	570	415	430	368
19	177	152	365	299	274	312	336	519	582	410	440	368
20	169	152	363	298	273	323	336	519	559	405	450	368
21	169	152	361	297	272	334	336	519	547	405	470	359
22	169	152	359	296	272	346	336	519	547	410	500	359
23	173	152	356	296	271	357	336	525	547	450	500	359
24	169	152	354	295	270	368	343	547	547	486	500	305
25	169	165	352	294	269	379	343	576	541	1123	500	293
26	169	179	350	293	268	386	349	735	536	576	500	265
27	169	192	348	292	268	386	349	856	536	503	500	260
28	169	206	345	292	266	386	326	917	541	492	500	260
29	169	220	343	291		386	280	1005	576	508	500	260
30	169	281	341	290		386	282	1088	594	805	500	260
31	165		339	289		386		1277		500	500	
MEAN	245	165	421	308	278	346	340	563	885	517	455	408
MAX	400	281	526	337	288	540	373	1277	1579	1123	500	510
MIN	165	152	339	289	266	266	280	290	536	405	430	260

MEAN FOR YEAR IS: 411

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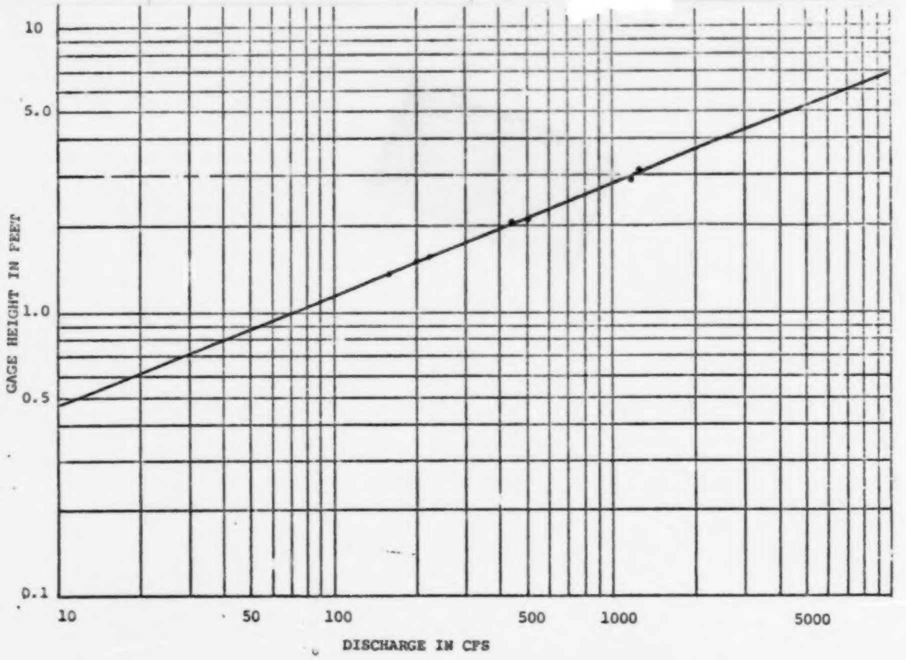
TONGUE RIVER #1--WATER YEARS 1977 AND 1978

Current meter measurements at the TR#1 cross section were started and the outside staff gage was installed on October 3,1975. Intermittent measurements of discharge and stage were made between October 1975 and June 3,1977 when the servo-manometer continuous stage recorder was installed. The manometer reading was initially set equal to the outside gage. Inside and outside gage height differences developed that were attributed to settling of the outside gage. The stage discharge curve for each water year was defined by measurements taken within that year and with adjustment coefficients applied to previous data to account for gage height datum changes when necessary. The stage discharge relationship for the 1977 and 1978 water years, up to May 21, 1978 was defined using 1977 water year measurements by an eye fitted line. The relationship is fairly well defined between 150 and 1300 cfs.

The stage record between January 4 and March 10 1978 was not interpretable due to ice effects. Daily records were not ob[illegible]ned from May 24,1978 to October 13,1978 due to damage to the orifice tu[illegible]ing the May 1978 flood.



Stage discharge curve for TR #1, water years 1977-1978

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TONGUE RIVER #1 AT NORTHERN RESERVATION LINE

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	227	216	177	230	23	230	477	603				
2	227	216	177	230	230	230	487	603				
3	227	209	177	230	230	230	552	609				
4	205	188	177	230	230	230	590	668				
5	188	174	177	230	230	230	590	765				
6	195	174	177	230	230	230	603	765				
7	223	174	146	230	230	230	603	808				
8	205	174	160	230	230	230	603	1070				
9	191	174	195	230	230	230	603	1120				
10	191	174	209	230	230	230	603	1380				
11	191	174	209	230	230	255	603	1580				
12	191	174	230	230	230	320	603	1672				
13	191	174	237	230	230	340	603	1708				
14	191	174	237	230	230	340	603	1708				
15	195	177	230	230	230	340	603	1708				
16	213	177	230	230	230	340	603	1733				
17	213	177	230	230	230	360	603	1955				
18	216	177	230	230	230	360	603	3000				
19	219	177	230	230	230	650	603	5300				
20	219	174	230	230	230	690	603	6700				
21	219	177	230	230	230	460	603	12000				
22	219	177	230	230	230	340	603					
23	219	132	230	230	230	385	603					
24	219	146	230	230	230	330	603					
25	219	160	230	230	230	315	603					
26	219	181	230	230	230	287	603					
27	219	195	230	230	230	279	603					
28	219	199	230	230	230	310	603					
29	216	188	230	230		375	603					
30	216	177	230	230		460	603					
31	216		230	230		460						
MEAN	210	179	213	230	223	332	592	2260				
MAX	227	216	237	230	230	690	603	12000				
MIN	188	132	146	230	23	230	477	603				

MEAN FOR YEAR IS: 530

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TONGUE RIVER #1

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										517	420	335
2										477	420	325
3									880	471	420	325
4									916	460	420	330
5									889	488	466	330
6									934	590	460	330
7									1100	488	450	330
8									1200	460	440	330
9									1270	460	430	330
10									1404	460	435	330
11									1600	471	410	330
12									1624	460	445	330
13									1500	460	460	335
14			196						1416	450	460	340
15									1270	445	460	335
16									1170	445	450	335
17									1070	430	435	287
18	288	331				131			1070	410	435	247
19					255				1130	415	430	223
20								1965	990	435	430	220
21									765	435	410	220
22									325	435	365	220
23									188	440	365	220
24				206					118	445	335	220
25							541		117	460	325	213
26									128	455	325	195
27									864	460	335	195
28									943	460	340	195
29									848	435	340	198
30									531	440	340	216
31										425	340	
MEAN	288	331	196	206	255	131	541	1965	938	457	406	279
MAX	288	331	196	206	255	131	541	1965	1624	590	466	340
MIN	288	331	196	206	255	131	541	1965	117	410	325	195

MEAN FOR YEAR IS: 499

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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TONGUE RIVER #1 AT NORTHERN RESERVATION LINE 1

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 16	OCT 31	NOV 3	DEC 5	FEB 27	MAR 30	APR 9	APR 25
DISCHARGE......	190	148	156	526	268	403	349	361
GAGE HEIGHT....	1.61	1.56	1.58	3.04	3.38	2.02	1.94	2.02
ADJ. GAGE HT...	1.61	1.56	1.58			2.02	1.94	1.93
WIDTH..........	123	120	123	127	108	122	122	122
AREA...........	222	188	204	272	182	263	247	257
MEAN DEPTH.....	1.80	0.78	1.66	2.14	1.68	2.15	2.02	2.10
MEAN VELOCITY..	0.87	1.56	0.76	1.93	1.47	1.54	1.41	1.40
# OF SECTIONS..	28	23	30	27	22	27	27	33
CHANGE IN G.HT.	0.03			0.01				
TIME...........	1.00	2.00	2.50	3.00	3.00	1.20	1.20	1.50
TEMPERATURE....	7.00	0.10	7.00	0.50	0.50	2.00	12	12
METER TYPE.....	AA	AA	AA	PYG	PYG	AA	AA	AA
FREE OR ICE....				ICE	MIX			
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	JWM	TJO	TJO	TJO	TJO	CBA	JWM

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TYPING GUIDE SHEET

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TONGUE RIVER #1 AT NORTHERN RESERVATION LINE

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE	MAY 23	JUN 20	JUL 27	AUG 20	SEP 26
DISCHARGE	505	544	489	483	268
GAGE HEIGHT	2.42	2.49	2.40	2.28	1.53
ADJ. GAGE HT.	2.27	2.34	2.25	2.24	1.80
WIDTH	122	123	122	124	123
AREA	291	295	282	283	225
MEAN DEPTH	2.38		1.74	2.28	1.83
MEAN VELOCITY	1.73	1.84	2.30	1.71	1.12
# OF SECTIONS	33	29	27	30	25
CHANGE IN G.HT.					
TIME	3.00	2.00	1.00	2.50	1.25
TEMPERATURE					19
METER TYPE	AA	AA	AA	AA	AA
FREE OR ICE					
SUSPENSION	ROD	ROD	ROD	ROD	ROD
GAGED BY	JWM	TJO	JWM	JWM	JWM

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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TONGUE RIVER #1 AT NORTHERN RESERVATION LINE

WATER YEAR 1978

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 14	NOV 2	FEB 9
DISCHARGE......	201	221	181
GAGE HEIGHT....	1.36		1.68
ADJ. GAGE HT...			
WIDTH..........	120	117	105
AREA...........	163	176	139
MEAN DEPTH.....	1.36	1.50	1.32
MEAN VELOCITY..	1.23	1.26	1.30
# OF SECTIONS..	31	30	21
CHANGE IN G.HT.	0.02		
TIME...........	1.50		
TEMPERATURE....	13		0.10
METER TYPE.....	PYG	AA	PYG
FREE OR ICE....			ICE
SUSPENSION.....	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	

TONGUE RIVER #1 AT NORTHERN RESERVATION LINE 1

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 18	NOV 18	DEC 14	JAN 24	MAR 18	APR 25	MAY 20	JUN 7
DISCHARGE......	288	331	196	206	131	541	1965	1185
GAGE HEIGHT....	1.42	1.50	1.41	2.20	0.88			2.92
ADJ. GAGE HT...								
WIDTH..........	120	120	120	120	107	120	126	119
AREA...........	196	205	142	148	106	257	480	351
MEAN DEPTH.....	1.63	1.71	1.19	1.23	0.99	2.14	3.81	2.93
MEAN VELOCITY..	1.47	1.61	1.38	1.39	1.24	2.11	4.09	3.38
# OF SECTIONS..	27	27	25	20	21	29	23	23
CHANGE IN G.HT.							0.02	
TIME...........								
TEMPERATURE....		1.90						
METER TYPE.....	AA	AA	PYG	PYG	AA	AA	AA	AA
FREE OR ICE....			ICE	ICE				
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	CAB	CAB
GAGED BY.......	TJO	TJO	TJO	TJO	TJO		TJO	

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TONGUE RIVER #1 AT NORTHERN RESERVATION LINE 2

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 9	AUG 15
DISCHARGE......	1261	431
GAGE HEIGHT....	3.10	1.97
ADJ. GAGE HT...		
WIDTH..........	120	120
AREA...........	347	244
MEAN DEPTH.....	2.90	2.04
MEAN VELOCITY..	3.63	1.72
# OF SECTIONS..	24	26
CHANGE IN G.HT.		
TIME...........		
TEMPERATURE....		20
METER TYPE.....	AA	AA
FREE OR ICE....		
SUSPENSION.....	CAB	ROD
GAGED BY.......		TJO

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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TONGUE RIVER #1

DATE		120575	012376	030176	030176	031776
POTASSIUM	PPM	6.00	5.00	5.00	6.00	6.00
SODIUM	PPM	73.00	56.00	68.00	68.00	67.00
CALCIUM	PPM	80.00	80.00	80.00	77.00	80.00
MAGNESIUM	PPM	61.00	55.00	55.00	57.00	57.00
SULFATE	PPM	315	286	286	287	294
CHLORIDE	PPM	8.00	6.00	6.00	12.00	0.00
CARBONATE	PPM	6.00	0.00	0.00	12.00	0.00
BICARBONATE	PPM	336	329	329	311	336
FLOURIDE	PPM	0.70	0.40	0.40	0.40	0.50
SILICON DIO	PPM	3.00	13.00	19.00	19.00	10.00
TOTAL P	PPM	0.05	0.11	0.03	0.03	0.10
NITRATE	PPM	0.10	0.10	1.00	1.00	1.00
POTASSIUM	EPM	0.15	0.13	0.13	0.15	0.15
SODIUM	EPM	3.18	2.44	2.96	2.96	2.91
CALCIUM	EPM	3.99	3.99	3.99	3.84	3.99
MAGNESIUM	EPM	5.02	4.52	4.52	4.69	4.69
SULFATE	EPM	6.56	5.95	5.95	5.98	6.12
CHLORIDE	EPM	0.23	0.17	0.17	0.17	0.20
CARBONATE	EPM	0.20	0.00	0.00	0.40	0.00
BICARBONATE	EPM	5.51	5.39	5.39	5.10	5.51
FLOURIDE	EPM	0.04	0.02	0.02	0.02	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		12.34	11.08	11.60	11.64	11.75
TOTAL ANIONS		12.47	11.49	11.49	11.62	11.80
DEVIATION		101	104	99.06	99.80	100
TDS (calc.)		717	650	650	666	676
TDS @180		754	652	652	692	737
TOTAL HARDNESS		449	425	427	427	434
ALKALINITY		285	270	275	275	275
NON-CARB HARD		164	155	152	152	0.00
LAB CONDUCTIVITY		1000	1000	1000	1000	1000
FIELD COND.						
LAB pH		8.40	8.10	8.80	8.80	7.00
FIELD pH		6.10	6.20	6.00	6.00	7.00

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TONGUE RIVER #1 2 of 7

DATE		042176	052776	070676	072776	090276
POTASSIUM	PPM	5.00	4.00	3.00	3.00	5.00
SODIUM	PPM	59.00	42.00	21.00	24.00	32.00
CALCIUM	PPM	70.00	68.00	36.00	41.00	51.00
MAGNESIUM	PPM	58.00	39.00	19.00	22.00	30.00
SULFATE	PPM	286	211	81.00	85.00	136
CHLORIDE	PPM	4.00	5.00	3.00	6.00	9.00
CARBONATE	PPM	6.00	0.00	0.00	12.00	84.00
BICARBONATE	PPM	281	244	154	153	49.00
FLOURIDE	PPM	0.40	0.30	0.20	0.20	0.30
SILICON DIO	PPM	2.00	2.00	3.00	3.00	4.00
TOTAL P	PPM	0.10	0.10	0.05	0.02	0.01
NITRATE	PPM	1.00	1.00	2.00	1.00	1.00
POTASSIUM	EPM	0.13	0.10	0.08	0.08	0.13
SODIUM	EPM	2.57	1.83	0.91	1.04	1.39
CALCIUM	EPM	3.49	3.39	1.80	2.05	2.54
MAGNESIUM	EPM	4.77	3.21	1.56	1.81	2.47
SULFATE	EPM	5.95	4.39	1.69	1.77	2.83
CHLORIDE	EPM	0.11	0.14	0.08	0.17	0.25
CARBONATE	EPM	0.20	0.00	0.00	0.40	2.80
BICARBONATE	EPM	4.61	4.00	2.52	2.51	0.80
FLOURIDE	EPM	0.02	0.02	0.01	0.01	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		10.96	8.53	4.35	4.98	6.53
TOTAL ANIONS		10.86	8.51	4.28	4.81	6.64
DEVIATION		99.13	99.80	98.50	96.72	102
TDS (calc.)		626	498	239	268	371
TDS @180		652	527	282	264	375
TOTAL HARDNESS		414	332	168	193	249
ALKALINITY		240	200	126	145	180
NON-CARB HARD		174	132	42.00	48.00	69.00
LAB CONDUCTIVITY		975	750	400	450	500
FIELD COND.						
LAB pH		8.30	7.80	8.20	8.50	9.40
FIELD pH			7.30	7.50	8.80	8.30

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(4-76)

TONGUE RIVER #1 3 of 7

DATE		091676	102076	111876	122076	012177
POTASSIUM	PPM	5.00	6.00	4.00	8.00	5.00
SODIUM	PPM	32.00	44.00	43.00	53.00	50.00
CALCIUM	PPM	60.00	72.00	70.00	74.00	80.00
MAGNESIUM	PPM	30.00	35.00	36.00	55.00	52.00
SULFATE	PPM	165	187	187	271	235
CHLORIDE	PPM	7.00	10.00	9.00	5.00	8.00
CARBONATE	PPM	12.00	36.00	13.00	48.00	0.00
BICARBONATE	PPM	195	171	222	232	329
FLOURIDE	PPM	0.30	0.30	0.30	0.40	0.40
SILICON DIO	PPM	3.00	5.00	19.00	8.00	6.00
TOTAL P	PPM	0.02	0.04	0.07	0.01	0.08
NITRATE	PPM	1.00	1.00	1.00	1.00	4.00
POTASSIUM	EPM	0.13	0.15	0.10	0.20	0.13
SODIUM	EPM	1.39	1.91	1.87	2.31	2.18
CALCIUM	EPM	2.99	3.59	3.49	3.69	3.99
MAGNESIUM	EPM	2.47	2.88	2.96	4.52	4.28
SULFATE	EPM	3.44	3.89	3.89	5.64	4.89
CHLORIDE	EPM	0.20	0.28	0.25	0.14	0.23
CARBONATE	EPM	0.40	1.20	0.43	1.60	0.00
BICARBONATE	EPM	3.20	2.80	3.64	3.80	5.39
FLOURIDE	EPM	0.02	0.02	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		6.98	8.54	8.43	10.73	10.57
TOTAL ANIONS		7.19	8.12	8.17	11.17	10.47
DEVIATION		103	95.10	96.94	104	99.07
TDS (calc.)		407	474	471	628	592
TDS @180		400	481	480	681	666
TOTAL HARDNESS		273	323	322	411	412
ALKALINITY		180	200	204	270	270
NON-CARB HARD		93.00	123	118	141	142
LAB CONDUCTIVITY		500	720	720	1000	920
FIELD COND.						
LAB pH		8.90	8.00	8.30	8.20	8.00
FIELD pH				7.90	6.40	7.80

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TONGUE RIVER #1 4 of 7

DATE		022277	040477	050277	052677	062077
POTASSIUM	PPM	4.00	4.00	4.00	3.00	13.00
SODIUM	PPM	53.00	41.00	40.00	15.00	23.00
CALCIUM	PPM	80.00	72.00	71.00	57.00	41.00
MAGNESIUM	PPM	43.00	44.00	42.00	6.00	17.00
SULFATE	PPM	231	216	207	69.00	94.00
CHLORIDE	PPM	7.00	6.00	6.00	6.00	8.00
CARBONATE	PPM	18.00	12.00	5.00	0.00	0.00
BICARBONATE	PPM	250	256	244	146	146
FLOURIDE	PPM	0.30	0.28	0.27	0.16	0.41
SILICON DIO	PPM	3.00	4.00	4.00	7.00	9.00
TOTAL P	PPM	0.10	0.02	0.02	0.01	0.02
NITRATE	PPM	1.00	0.30	0.13	0.86	0.80
POTASSIUM	EPM	0.10	0.10	0.10	0.08	0.33
SODIUM	EPM	2.31	1.78	1.74	0.65	1.00
CALCIUM	EPM	3.99	3.59	3.54	2.84	2.05
MAGNESIUM	EPM	3.54	3.62	3.45	0.49	1.40
SULFATE	EPM	4.81	4.50	4.31	1.44	1.96
CHLORIDE	EPM	0.20	0.17	0.17	0.17	0.23
CARBONATE	EPM	0.60	0.40	0.17	0.00	0.00
BICARBONATE	EPM	4.10	4.20	4.00	2.39	2.39
FLOURIDE	EPM	0.02	0.01	0.01	0.01	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		9.94	9.10	8.84	4.07	4.78
TOTAL ANIONS		9.67	9.23	8.61	3.96	4.54
DEVIATION		97.31	101	97.45	97.43	95.00
TDS (calc.)		559	521	495	228	268
TDS @180		551	576	536	222	282
TOTAL HARDNESS		377	363	350	167	171
ALKALINITY		235	230	208	120	120
NON-CARB HARD		142	133	142	47.00	51.00
LAB CONDUCTIVITY		880	850	741	365	437
FIELD COND.						
LAB pH		8.40	8.40	8.40	8.10	8.10
FIELD pH			8.30	7.90		

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TONGUE RIVER #1 5 of 7

DATE		062077	072577	082377	101177	033079
POTASSIUM	PPM	13.00	3.00	4.00	14.00	8.00
SODIUM	PPM	23.00	22.00	34.00	50.00	91.00
CALCIUM	PPM	41.00	43.00	55.00	58.00	83.00
MAGNESIUM	PPM	17.00	28.00	32.00	47.00	64.00
SULFATE	PPM	94.00	104	160	223	395
CHLORIDE	PPM	8.00	5.00	8.00	10.00	13.00
CARBONATE	PPM	0.00	12.00	12.00	9.00	0.00
BICARBONATE	PPM	146	159	183	244	317
FLOURIDE	PPM	0.41	0.22	0.24	0.27	
SILICON DIO	PPM	9.00	4.00	4.00	9.00	
TOTAL P	PPM	0.02	0.04	0.02	0.08	0.07
NITRATE	PPM	0.80	0.30	0.10	0.10	0.14
POTASSIUM	EPM	0.33	0.08	0.10	0.36	0.20
SODIUM	EPM	1.00	0.96	1.48	2.18	3.96
CALCIUM	EPM	2.05	2.15	2.74	2.89	4.14
MAGNESIUM	EPM	1.40	2.30	2.63	3.87	5.26
SULFATE	EPM	1.96	2.17	3.33	4.64	8.22
CHLORIDE	EPM	0.23	0.14	0.23	0.28	0.37
CARBONATE	EPM	0.00	0.40	0.40	0.30	0.00
BICARBONATE	EPM	2.39	2.61	3.00	4.00	5.20
FLOURIDE	EPM	0.02	0.01	0.01	0.01	
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		4.78	5.48	6.96	9.29	13.57
TOTAL ANIONS		4.54	5.29	6.91	9.17	66.28
DEVIATION		95.00	96.44	99.31	98.63	488
TDS (calc.)		268	295	395	531	810
TDS @180		282	311	396	555	796
TOTAL HARDNESS		171	225	269	337	471
ALKALINITY		120	150	170	215	260
NON-CARB HARD		51.00	75.00	99.00	122	211
LAB CONDUCTIVITY		437	490	624	823	1060
FIELD COND.				575	550	
LAB pH		8.10	8.50	8.50	8.30	8.10
FIELD pH			8.30	8.45	7.50	

1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TONGUE RIVER #1 6 of 7

DATE		050879	052279	082979
POTASSIUM	PPM	7.00	7.00	5.00
SODIUM	PPM	80.00	76.00	31.00
CALCIUM	PPM	81.00	85.00	55.00
MAGNESIUM	PPM	63.00	61.00	38.00
SULFATE	PPM	374	393	194
CHLORIDE	PPM	10.00	6.00	3.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	305	293	207
FLOURIDE	PPM			
SILICON DIO	PPM			
TOTAL P	PPM	0.07	0.08	0.01
NITRATE	PPM	0.10	0.10	0.10
POTASSIUM	EPM	0.18	0.18	0.13
SODIUM	EPM	3.48	3.31	1.35
CALCIUM	EPM	4.04	4.24	2.74
MAGNESIUM	EPM	5.18	5.02	3.13
SULFATE	EPM	7.79	8.18	4.04
CHLORIDE	EPM	0.28	0.17	0.08
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	5.00	4.80	3.39
FLOURIDE	EPM			
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		12.88	12.74	7.35
TOTAL ANIONS		65.58	65.70	60.08
DEVIATION		509	516	818
TDS (calc.)		765	772	428
TDS @180		754	781	444
TOTAL HARDNESS		461	461	294
ALKALINITY		250	240	170
NON-CARB HARD		211	221	124
LAB CONDUCTIVITY		1200	1120	700
FIELD COND.		952		
LAB pH		8.20	7.80	8.10
FIELD pH				

EPA-287 (Cin.)
(4-76)

TONGUE RIVER #1 7 of 7

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	5.89	8.52	28.00
SODIUM	PPM	46.82	398	28.00
CALCIUM	PPM	65.75	226	28.00
MAGNESIUM	PPM	41.54	255	28.00
SULFATE	PPM	217	8619	28.00
CHLORIDE	PPM	6.96	4.89	28.00
CARBONATE	PPM	10.61	323	28.00
BICARBONATE	PPM	235	5624	28.00
FLOURIDE	PPM	0.34	0.01	24.00
SILICON DIO	PPM	7.17	27.89	24.00
TOTAL P	PPM	0.03	0.00	28.00
NITRATE	PPM	0.03	1.22	28.00
POTASSIUM	EPM	0.15		
SODIUM	EPM	2.04		
CALCIUM	EPM	3.28		
MAGNESIUM	EPM	3.42		
SULFATE	EPM	4.51		
CHLORIDE	EPM	0.20		
CARBONATE	EPM	0.35		
BICARBONATE	EPM	3.84		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		8.89	8.02	28.00
TOTAL ANIONS		16.38	392	28.00
DEVIATION		168	31300	28.00
TDS (calc.)		510	29379	28.00
TDS @180		528	30769	28.00
TOTAL HARDNESS		335	9949	28.00
ALKALINITY		210	2874	28.00
NON-CARB HARD		119	2979	28.00
LAB CONDUCTIVITY		774	59861	28.00
FIELD COND.		692	33818	3.00
LAB pH		8.28	0.17	28.00
FIELD pH		7.40	0.85	17.00

2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TONGUE RIVER AT ASHLAND--STATION DESCRIPTION

Miscellaneous water discharge and suspended sediment measurements were taken at Ashland, Montana during the 1979 water year as part of a suspended sediment study on the Tongue River (Andrews and Osborne, 1979). A total of 9 measurements were made, four by cable suspension from the St. Labre road bridge and five by rod suspension at a cross-section approximately 100 meters below the Highway 212 bridge. Both measurement sites are above the mouth of Otter Creek. Measurement dates, discharge and cross sectiontal data are included in the following field measurement summary sheets. Adjusted gage heights when given are for TR#1.

TONGUE RIVER AT ASHLAND

1

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	MAR 11	JUN 1	JUN 8	JUN 14	JUN 27	JUL 11	JUL 18	JUL 26
DISCHARGE......	341	1527	1220	627	544	425	421	535
GAGE HEIGHT....		3.70	3.38	2.54				
ADJ. GAGE HT...		3.55	3.23	2.39				
WIDTH..........	126	128	128	92	117	108	94	92
AREA...........	399	396	335	202	211	291	157	193
MEAN DEPTH.....	3.17	3.08	2.62	2.20	2.57	1.46	1.66	2.10
MEAN VELOCITY..	0.85	3.89	3.64	3.10	1.80	2.70	2.52	2.77
# OF SECTIONS..	6.00	16	32	26	29	24	25	23
CHANGE IN G.HT.			0.10					
TIME...........	0.45		4.00	2.15	3.00	4.00	1.00	3.00
TEMPERATURE....	0.20		15		24	26	22	22
METER TYPE.....	PYG	AA	AA	AA	AA	AA	AA	AA
FREE OR ICE....	ICE							
SUSPENSION.....	ROD	CAB	CAB	CAB	ROD	ROD	ROD	CAB
GAGED BY.......	TJO	TJO	CBA	TJO	TJO	JWM	JWM	JWM

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

TONGUE RIVER AT ASHLAND 2

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	SEP 25
DISCHARGE......	355
GAGE HEIGHT....	
ADJ. GAGE HT...	
WIDTH..........	91
AREA...........	143
MEAN DEPTH.....	1.57
MEAN VELOCITY..	2.14
# OF SECTIONS..	18
CHANGE IN G.HT.	
TIME...........	1.00
TEMPERATURE....	18
METER TYPE.....	AA
FREE OR ICE....	
SUSPENSION.....	ROD
GAGED BY.......	JWM

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

LOGGING CREEK #1

STATION DESCRIPTION

Gaging house, stilling well, float gage, Leopold-Stevens A-71 recorder, 3 foot Parshall flume and outside staff gage. The station is located in NE 1/4 NW 1/4 NE 1/4 Section 28, T. 3S, R. 44 E about one quarter mile above the confluence of Logging Creek with Tongue River.

PERIOD OF OPERATION

October 1976 to the present. Data for water year 1978 is not yet available.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, no flow September 11-20, 1977.
Maximum daily discharge, exceed flume capacity of 40cfs, during May 1978.

STAGE-DISCHARGE CURVE

A standard rating curve for a three foot Parshall flume was used to convert stage heights to discharge. The recorder was set to agree with the outside gage. The datum is the base of the flume, 0.00 feet on the staff gage.

MALFUNCTIONS

Operational problems occurred from February 14 to May 25, 1977, which resulted in a loss of stage records during this period. During water year 1979, the clock was not working during the periods January 3-10 and September 1-6. The intake pipe was frozen during February and March. The flume was undermined in late March and repaired on July 30,1979.

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LOGGING CREEK

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.96	.96	1.20	1.00	1.00	1.00	.20	.00	.00	.00	2.01	1.60
2	.96	.96	1.12	1.00	1.00	1.00	.20	.00	.00	.00	1.92	1.60
3	.96	.96	.13	1.00	1.00	1.00	.20	.00	.00	.00	1.82	1.60
4	.96	.96	1.28	1.00	1.00	1.00	.10	.00	.00	.00	1.82	1.60
5	.96	.94	1.28	1.00	1.00	1.00	.10	.00	.00	.00	1.82	1.60
6	.96	.94	1.28	1.00	1.00	3.00	.10	.00	.00	.00	1.82	1.60
7	.96	.96	1.37	1.00	1.00	3.00	.10	.00	.03	.00	1.73	1.54
8	.96	.96	2.32	1.00	1.00	50	.10	.00	.03	.00	1.73	1.54
9	.96	1.54	1.82	1.00	1.00	37	.10	.00	.03	.00	1.73	1.54
10	.96	1.12	1.37	1.00	1.00	29	.10	.00	.03	.00	1.73	1.54
11	.96	.94	1.37	1.00	1.00	28	.00	.00	.03	.00	1.73	1.54
12	.96	.96	1.37	1.00	1.00	29	.00	.00	.03	.00	1.73	1.54
13	.96	1.04	1.37	1.00	1.00	20	.00	.00	.08	.00	1.73	1.54
14	.86	.96	1.37	1.00	1.00	12	.00	.00	.08	.00	1.82	1.54
15	.96	.86	1.37	1.00	1.00	8.00	.00	.00	.08	.00	2.11	1.63
16	.96	.86	1.37	1.00	1.00	7.00	.00	.00	.08	.00	2.11	1.82
17	.94	.86	1.28	1.00	1.00	6.00	.00	.00	.08	.00	2.01	1.82
18	.86	.96	1.54	1.00	1.00	5.00	.00	.00	.08	.00	2.01	1.73
19	.86	.96	1.28	1.00	1.00	4.00	.00	.00	.08	.00	1.92	1.73
20	.86	.96	1.28	1.00	1.00	3.00	.00	.00	.08	.00	1.82	1.73
21	.86	1.12	1.37	1.00	1.00	1.00	.00	.00	.00	.00	1.82	1.63
22	.86	1.20	1.37	1.00	1.00	.33	.00	.00	.00	.00	1.82	1.63
23	.94	1.20	1.37	1.00	1.00	.30	.00	.00	.00	.00	1.82	1.73
24	.94	1.20	1.37	1.00	1.00	.30	.00	.00	.00	3.00	1.82	1.73
25	1.12	1.12	1.37	1.00	1.00	.20	.00	.00	.00	27	1.73	1.73
26	.94	1.28	1.28	1.00	1.00	.20	.00	.00	.00	6.00	1.70	1.82
27	.94	1.28	1.28	1.00	1.00	.20	.00	.00	.00	5.00	1.73	1.82
28	.94	1.20	1.54	1.00	1.00	.20	.00	.00	.00	4.00	1.73	1.73
29	.96	1.28	1.00	1.00		.20	.00	.00	.00	3.00	1.73	1.73
30	.96	1.28	1.00	1.00		.20	.00	.00	.00	2.00	1.73	1.73
31	.94		1.00	1.00		.20		.00		2.00	1.73	
MEAN	.94	1.06	1.31	1.00	1.00	8.13	.04		.02	1.67	1.82	1.65
MAX	1.12	1.54	2.32	1.00	1.00	50	.20		.08	27	2.11	1.82
MIN	.86	.86	.13	1.00	1.00	.20					1.70	1.54

MEAN FOR YEAR IS: 1.55

NOTE: Gage heights during March 8-13 were affected to some degree by ice anchored in the flume.

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LOGGING CREEK #1

WATER YEAR 1978

MEAN DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	.65	.94	1.04	.50	.50	1.37	.65	1.37	8.46	.78	.96
2	.90	.71	.94	1.04	.50	.50	1.37	.58	1.12	1.37	.78	.96
3	.90	.71	.86	1.04	.50	.50	1.46	.58	.94	.71	.86	.94
4	.90	.71	.94	.96	.50	.50	1.54	.78	.86	.65	.94	.86
5	.90	.71	.86	.86	.50	.50	1.54	.89	7.17	.78	.94	.86
6	.90	.71	.86	.86	.50	.50	1.12	.62	1.20	1.20	.86	1.20
7	.90	.71	.86	.86	.60	.50	.52	1.36	1.20	1.92	.78	.96
8	.90	.78	.94	.71	.50	.60	.46	13	1.20	.94	.71	.96
9	.90	.78	.94	.65	.50	.70	.46	1.56	1.28	.78	.71	.96
10	.80	.78	.94	.65	.50	.80	.40	1.04	.65	.78	.78	.96
11	.80	.78	.96	.58	.50	.80	.35	.96	.78	.78	.78	.96
12	.80	.86	.96	.52	.50	.90	.35	.96	.71	.71	.78	1.37
13	.80	.94	.96	.52	.50	1.10	.20	.86	.65	.65	.78	2.53
14	.78	.94	.96	.52	.50	1.54	.20	.78	.58	.65	.94	1.54
15	.78	.96	2.64	.46	.50	2.21	.20	.78	.58	.65	1.12	1.20
16	.86	.96	2.32	.46	.50	2.53	.46	.76	.65	.52	1.04	1.28
17	.86	.86	1.20	.46	.50	7.17	.65	6.41	.71	.58	1.20	1.28
18	.94	.86	.89	.46	.50	41	.46	58	.86	.50	1.12	1.63
19	.96	.94	1.37	.52	.50	11	.65	31	.71	.71	1.04	3.44
20	.96	.86	1.37	.50	.50	11	.71	3.32	.58	.96	1.04	1.63
21	.96	.96	.96	.50	.50	5.39	.65	1.82	.52	.96	.96	1.46
22	.96	.86	.86	.50	.50	3.44	.58	1.20	.78	1.20	.96	1.37
23	.96	.86	.94	.50	.50	2.53	.65	1.04	.78	.96	.96	1.37
24	.94	.96	.96	.50	.50	2.42	.35	.96	.65	.71	.96	1.12
25	.94	1.12	.96	.50	.50	2.11	.35	.94	.62	.71	.96	1.04
26	.86	1.14	.96	.50	.50	1.92	.30	.86	.65	.65	.94	1.28
27	.86	1.04	.96	.50	.50	2.01	.30	.86	.65	.58	.96	1.12
28	.86	.96	.96	.50	.50	1.54	.65	.78	.52	.58	1.20	1.04
29	.86	.96	.96	.50		.96	.78	.78	.52	.71	1.12	1.04
30	.71	1.04	.96	.50		1.20	.71	1.20	.46	.71	1.04	1.04
31	.65		1.04	.50		1.37		1.20		.71	.96	
MEAN	.87	.87	1.07	.61	.50	3.54	.65	4.41	.99	1.05	.93	1.27
MAX	.96	1.14	2.64	1.04	.60	41	1.54	58	1.17	8.46	1.20	3.44
MIN	.65	.65	.86	.46	.50	.50	.20	.58	.46	.50	.71	.86

MEAN FOR YEAR IS: 1.40

EPA-287 (Cin.)
(4-76)

LOGGING CREEK NEAR THE MOUTH

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1		.75	1.54		1.12				1.04	.53	.38	.48
2		.82	1.54		1.04				.96	.75	.18	.43
3		.88	1.46		.96			.64	.75	.58	.11	.34
4			1.37		.96				.52	.82	.07	.34
5			1.37		.96		2.01		.70	.96	.43	.30
6			1.37	2.01	.96				.70	7.79	.48	.11
7	.70		1.54	2.32	.96				.75	.96	.64	.07
8	.70	1.20	1.63	2.01	.96				.75	1.12	.53	.04
9	.70	1.20	1.54	1.82	.96				.88	.70	.53	.04
10	.70	1.12	1.92	1.04	.96				.82	.70	.53	.04
11	.70	1.54	2.23	1.46	1.04				1.37	.70	.43	
12	.70	1.12	2.22	1.37	1.82				1.20	.64	.43	
13	.70	1.12	2.22		5.39				.88	.64	.38	
14	.70	1.12	2.22		25				.75	.58	.34	
15	.70	1.12	2.01		14				1.37	.53	.30	
16	.70	1.20	2.01						.88	.53	.18	
17	.70	1.63	2.11						1.12	.53	.26	
18	.82	1.63	1.92						.82	.48	.38	
19	.82	1.63	1.82						.75	.70	.38	
20	1.12	1.28	2.11	2.32					1.37	.48	.38	
21	.75	1.12	3.32	2.11					.96	.38	.34	.11
22	.75	1.37	2.11	1.92	5.11				.82	.38	.34	.75
23	.88	1.20	1.82	1.46					.75	.38	.34	.88
24	.96	1.54	1.82	1.28					.58	.38	.38	1.04
25	.96	1.63	2.32	1.28	1.73				.58	.48	.38	.82
26	.96	1.82	1.82	1.28				.96	.64	.64	.38	.82
27	1.54	2.01	2.53	2.01			.38	.96	.64	.70	.38	.75
28	.75	2.22	2.11	2.01				1.20	.58	.64	.43	.70
29	.75	1.37	2.01	1.92				1.46	.58	.64	.48	.70
30	1.37	1.28	2.22	1.54				1.37	.53	.75	.48	.96
31	.63		2.53	1.28				1.20		.38	.48	
MEAN	.83	1.34	1.96	1.70	3.76		1.19	1.11	.83	.85	.37	.48
MAX	1.54	2.22	3.32	2.32	25		2.01	1.46	1.37	7.79	.64	1.04
MIN	.63	.75	1.37	1.04	.96		.38	.64	.52	.38	.07	.04

MEAN FOR YEAR IS: 1.31

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

LOGGING CREEK AT THE FLUME 1 of 6

DATE		120575	012376	030176	031776	042176
POTASSIUM	PPM	11.00	7.00	8.00	8.00	10.00
SODIUM	PPM	73.00	58.00	60.00	67.00	79.00
CALCIUM	PPM	72.00	64.00	62.00	67.00	60.00
MAGNESIUM	PPM	66.00	56.00	56.00	57.00	66.00
SULFATE	PPM	162	129	126	130	171
CHLORIDE	PPM	7.00	5.00	5.00	4.00	4.00
CARBONATE	PPM	0.00	0.00	12.00	18.00	54.00
BICARBONATE	PPM	549	476	451	45.00	397
FLOURIDE	PPM	1.20	1.00	1.00	1.10	1.10
SILICON DIO	PPM	19.00	15.00	15.00	12.00	9.00
TOTAL P	PPM	0.05	0.08	0.03	0.10	0.10
NITRATE	PPM	0.10	0.10	1.00	1.00	1.00
POTASSIUM	EPM	0.28	0.18	0.20	0.20	0.26
SODIUM	EPM	3.18	2.52	2.61	2.91	3.44
CALCIUM	EPM	3.59	3.19	3.09	3.34	2.99
MAGNESIUM	EPM	5.43	4.61	4.61	4.69	5.43
SULFATE	EPM	3.37	2.69	2.62	2.71	3.56
CHLORIDE	EPM	0.20	0.14	0.14	0.11	0.11
CARBONATE	EPM	0.00	0.00	0.40	0.60	1.80
BICARBONATE	EPM	9.00	7.80	7.39	0.74	6.51
FLOURIDE	EPM	0.06	0.05	0.05	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		12.48	10.50	10.51	11.15	12.12
TOTAL ANIONS		12.58	10.65	10.57	4.18	12.01
DEVIATION		101	101	101	37.52	99.10
TDS (calc.)		680	553	551	576	639
TDS @180		698	576	598	599	683
TOTAL HARDNESS		449	389	387	401	422
ALKALINITY		450	390	390	405	415
NON-CARB HARD		0.00	0.00	0.00	0.00	7.00
LAB CONDUCTIVITY		980	900	800	950	1050
FIELD COND.						
LAB pH		8.30	8.00	8.90	7.90	8.10
FIELD pH		6.50	6.20	6.40	7.10	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
9-1/8"
3/8"

EPA-287 (Cin.)
(4-76)

LOGGING CREEK AT THE FLUME 2 of 6

DATE		060176	060276	070676	072776	091676
POTASSIUM	PPM	12.00	9.00	15.00	11.00	21.00
SODIUM	PPM	45.00	52.00	61.00	62.00	74.00
CALCIUM	PPM	49.00	43.00	63.00	51.00	172
MAGNESIUM	PPM	39.00	49.00	57.00	61.00	18.00
SULFATE	PPM	105	101	132	102	193
CHLORIDE	PPM	4.00	4.00	4.00	5.00	10.00
CARBONATE	PPM	0.00	0.00	24.00	6.00	48.00
BICARBONATE	PPM	366	415	458	506	488
FLOURIDE	PPM	0.70	0.50	0.90	1.00	1.10
SILICON DIO	PPM	14.00	12.00	12.00	13.00	18.00
TOTAL P	PPM		0.50	0.05	0.02	0.07
NITRATE	PPM		1.00	1.00	1.00	2.00
POTASSIUM	EPM	0.31	0.23	0.38	0.28	0.54
SODIUM	EPM	1.96	2.26	2.65	2.70	3.22
CALCIUM	EPM	2.45	2.15	3.14	2.54	8.58
MAGNESIUM	EPM	3.21	4.03	4.69	5.02	1.48
SULFATE	EPM	2.19	2.10	2.75	2.12	4.02
CHLORIDE	EPM	0.11	0.11	0.11	0.14	0.28
CARBONATE	EPM	0.00	0.00	0.80	0.20	1.60
BICARBONATE	EPM	6.00	6.80	7.51	8.29	8.00
FLOURIDE	EPM	0.04	0.03	0.05	0.05	0.06
NITRATE	EPM		0.01	0.00	0.00	0.00
TOTAL CATIONS		7.92	8.67	10.87	10.54	13.82
TOTAL ANIONS		24.42	9.02	11.19	10.77	13.88
DEVIATION		308	104	103	102	100
TDS (calc.)		434	462	581	547	776
TDS @180		416	454	597	564	728
TOTAL HARDNESS		280	310	391	376	503
ALKALINITY		300	340	415	425	480
NON-CARB HARD		0.00	0.00	0.00	0.00	23.00
LAB CONDUCTIVITY		700	850	800	900	1000
FIELD COND.						
LAB pH			6.80	8.30	8.20	8.80
FIELD pH				7.20	7.90	6.80

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LOGGING CREEK AT THE FLUME 3 of 6

DATE		102076	111876	122176	012077	012077
POTASSIUM	PPM	13.00	9.00	9.00	9.00	9.00
SODIUM	PPM	92.00	76.00	105	63.00	63.00
CALCIUM	PPM	120	108	84.00	90.00	90.00
MAGNESIUM	PPM	49.00	40.00	88.00	64.00	64.00
SULFATE	PPM	185	153	277	200	200
CHLORIDE	PPM	12.00	9.00	13.00	9.00	9.00
CARBONATE	PPM	36.00	60.00	0.00	0.00	0.00
BICARBONATE	PPM	525	390	586	525	525
FLOURIDE	PPM	1.00	1.00	1.20	1.10	1.10
SILICON DIO	PPM	20.00	3.00	22.00	25.00	25.00
TOTAL P	PPM	0.06	0.10	0.24	0.02	0.02
NITRATE	PPM	2.00	1.00	2.00	1.00	1.00
POTASSIUM	EPM	0.33	0.23	0.23	0.23	0.23
SODIUM	EPM	4.00	3.31	4.57	2.74	2.74
CALCIUM	EPM	5.99	5.39	4.19	4.49	4.49
MAGNESIUM	EPM	4.03	3.29	7.24	5.26	5.26
SULFATE	EPM	3.85	3.19	5.77	4.16	4.16
CHLORIDE	EPM	0.34	0.25	0.37	0.25	0.25
CARBONATE	EPM	1.20	2.00	0.00	0.00	0.00
BICARBONATE	EPM	8.60	6.39	9.60	8.60	8.60
FLOURIDE	EPM	0.05	0.05	0.06	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.35	12.22	16.23	12.73	12.73
TOTAL ANIONS		13.96	11.82	15.71	13.01	13.01
DEVIATION		97.26	96.75	96.80	102	102
TDS (calc.)		765	647	864	693	693
TDS @180		801	657	911	772	772
TOTAL HARDNESS		501	432	569	486	486
ALKALINITY		490	420	480	430	430
NON-CARB HARD		11.00	12.00	89.00	56.00	56.00
LAB CONDUCTIVITY		1080	1000	1380	1100	1100
FIELD COND.						
LAB pH		8.10	8.30	8.30	8.10	8.10
FIELD pH			8.10	6.00	8.10	8.10

9-1/8"
1/2"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LOGGING CREEK AT THE FLUME 4 of 6

DATE		022277	040477	050277	052677	062177
POTASSIUM	PPM	8.00	11.00	14.00	13.00	10.00
SODIUM	PPM	73.00	100.00	110	75.00	80.00
CALCIUM	PPM	88.00	66.00	84.00	79.00	47.00
MAGNESIUM	PPM	47.00	60.00	78.00	59.00	66.00
SULFATE	PPM	191	217	219	179	134
CHLORIDE	PPM	7.00	6.00	9.00	9.00	6.00
CARBONATE	PPM	24.00	36.00	42.00	60.00	36.00
BICARBONATE	PPM	378	390	543	415	439
FLOURIDE	PPM	0.80	1.10	1.20	1.10	1.20
SILICON DIO	PPM	16.00	15.00	14.00	12.00	13.00
TOTAL P	PPM	0.10	0.04	0.03	0.01	0.27
NITRATE	PPM	1.00	0.20	0.19	0.20	0.10
POTASSIUM	EPM	0.20	0.28	0.36	0.33	0.26
SODIUM	EPM	3.18	4.35	4.78	3.26	3.48
CALCIUM	EPM	4.39	3.29	4.19	3.94	2.35
MAGNESIUM	EPM	3.87	4.94	6.42	4.85	5.43
SULFATE	EPM	3.98	4.52	4.56	3.73	2.79
CHLORIDE	EPM	0.20	0.17	0.25	0.25	0.17
CARBONATE	EPM	0.80	1.20	1.40	2.00	1.20
BICARBONATE	EPM	6.20	6.39	8.90	6.80	7.20
FLOURIDE	EPM	0.04	0.06	0.06	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.64	12.86	15.75	12.39	11.51
TOTAL ANIONS		11.16	12.29	15.11	12.77	11.38
DEVIATION		95.91	95.59	95.93	103	98.85
TDS (calc.)		624	688	823	678	595
TDS @180		642	682	852	690	643
TOTAL HARDNESS		412	410	529	439	390
ALKALINITY		350	380	515	440	420
NON-CARB HARD		62.00	30.00	14.00	0.00	0.00
LAB CONDUCTIVITY		980	1080	1216	1012	1028
FIELD COND.						
LAB pH		8.20	8.40	8.30	8.30	8.30
FIELD pH			7.90	7.70		

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET

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TOP OF IMAGE AREA

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LOGGING CREEK AT THE FLUME 5 of 6

DATE		072577	101177	033079
POTASSIUM	PPM	13.00	25.00	10.00
SODIUM	PPM	80.00	90.00	59.00
CALCIUM	PPM	49.00	66.00	59.00
MAGNESIUM	PPM	71.00	70.00	51.00
SULFATE	PPM	137	181	165
CHLORIDE	PPM	8.00	12.00	8.00
CARBONATE	PPM	0.00	36.00	0.00
BICARBONATE	PPM	549	488	378
FLOURIDE	PPM	1.10	1.00	
SILICON DIO	PPM	15.00	17.00	
TOTAL P	PPM	0.08	0.08	0.07
NITRATE	PPM	0.20	0.10	0.20
POTASSIUM	EPM	0.33	0.64	0.26
SODIUM	EPM	3.48	3.91	2.57
CALCIUM	EPM	2.45	3.29	2.94
MAGNESIUM	EPM	5.84	5.76	4.20
SULFATE	EPM	2.85	3.77	3.44
CHLORIDE	EPM	0.23	0.34	0.23
CARBONATE	EPM	0.00	1.20	0.00
BICARBONATE	EPM	9.00	8.00	6.20
FLOURIDE	EPM	0.06	0.05	
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		12.10	13.61	9.96
TOTAL ANIONS		12.08	13.27	62.39
DEVIATION		99.82	97.53	626
TDS (calc.)		628	720	538
TDS @180		666	694	538
TOTAL HARDNESS		414	452	358
ALKALINITY		450	460	310
NON-CARB HARD		0.00	0.00	48.00
LAB CONDUCTIVITY		1039	1107	800
FIELD COND.			700	
LAB pH		8.10	8.40	8.00
FIELD pH		8.10		

1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

LOGGING CREEK AT THE FLUME 6 of 6

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	11.52	17.12	23.00
SODIUM	PPM	73.78	271	23.00
CALCIUM	PPM	75.35	791	23.00
MAGNESIUM	PPM	57.91	196	23.00
SULFATE	PPM	165	1811	23.00
CHLORIDE	PPM	7.35	7.53	23.00
CARBONATE	PPM	21.39	456	23.00
BICARBONATE	PPM	447	11488	23.00
FLOURIDE	PPM	1.02	0.03	22.00
SILICON DIO	PPM	15.27	24.02	22.00
TOTAL P	PPM	0.08	0.01	22.00
NITRATE	PPM	0.23	0.96	22.00
POTASSIUM	EPM	0.29		
SODIUM	EPM	3.21		
CALCIUM	EPM	3.76		
MAGNESIUM	EPM	4.76		
SULFATE	EPM	3.43		
CHLORIDE	EPM	0.21		
CARBONATE	EPM	0.71		
BICARBONATE	EPM	7.33		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		12.03	3.76	23.00
TOTAL ANIONS		14.66	115	23.00
DEVIATION		129	13268	23.00
TDS (calc.)		642	11035	23.00
TDS @180		662	13007	23.00
TOTAL HARDNESS		425	4337	23.00
ALKALINITY		417	2886	23.00
NON-CARB HARD		17.74	654	23.00
LAB CONDUCTIVITY		994	21527	23.00
FIELD COND.		700	0.00	1.00
LAB pH		8.19	0.14	22.00
FIELD pH		7.29	0.58	14.00

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK #1

STATION DESCRIPTION

This station consists of a gaging house, stilling well, float gage, Leopold-Stevens A-71 recorder, seven foot Cipolletti weir and outside staff gage. The station is located in SW 1/4 SE 1/4 NW 1/4 Section 25 T. 5 S. R. 42 E., about one quarter mile above the confluence of Cook Creek with Tongue River.

PERIOD OF OPERATION

October 1976 to current year.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 0.5 cfs, August 1977.
Maximum discharge, 113 cfs, July 25,1979.

STAGE DISCHARGE CURVE

A standard rating curve for a seven foot Cipolletti weir was used to convert gage heights to discharge. The datum was the elevation of the weir crest which corresponded to an outside gage height of 1.885 feet on June 7, 1977. The outside gage elevation was surveyed several times and found to settle 0.015 feet in 1978, giving a gage height equal to 1.870 at the weir crest. The latter datum was used in interpretation of water year 1979 gage heights. The weir-rated discharge was checked several times with current meter measurements and found to agree within measurement accuracy.

MALFUNCTIONS

Operational problems were encountered during the winter of 1976-1977. During the summer of 1977 the intake pipe was plugged by sedimentation causing the loss of record during low flow periods. High flows flushed the pipe during the late summer. This problem was rectified in 1978. The wing wall fill washed out in March 1978 and was repaired April 25,1978. The opposite wing wall fill washed out July 25,1979 and was repaired in September 1979.

EPA-287 (Cin.)
(4-76)

COOK CREEK #1 NEAR THE MOUTH

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.37	.85	1.00	1.00	1.00	1.00	.85	1.12	1.00	.35	.50	.50
2	1.37	.85	1.00	1.00	1.00	1.00	1.12	1.12	1.24	.50	.50	.50
3	1.37	1.12	1.00	1.00	1.00	1.00	1.37	.50	1.24	.50	.50	.50
4	1.37	1.12	1.00	1.00	1.00	1.00	1.37	.75	1.24	.45	.50	.50
5	1.12	1.12	1.00	1.00	1.00	1.00	1.50	1.00	1.24	.45	.50	.50
6	1.12	1.00	1.00	1.00	1.00	1.00	1.80	1.12	1.12	.25	.50	.50
7	1.12	.85	1.00	1.00	1.00	1.00	1.80	1.00	1.37	.25	.50	.50
8	1.12	.85	1.00	1.00	1.00	.75	1.65	.85	1.00	.25	.50	.50
9	1.00	.85	1.00	1.00	1.00	.75	1.37	1.12	1.12	.35	.50	.35
10	1.12	.85	1.00	1.00	1.00	.75	1.12	1.00	.65	.25	.50	.45
11	1.00	1.00	1.00	1.00	1.00	.85	1.50	.85	.25	.25	.50	.65
12	1.00	1.00	1.00	1.00	1.00	1.24	1.37	.85	.50	.25	.50	.50
13	1.00	1.00	1.00	1.00	1.00	2.77	1.24	.85	.50	.25	.50	.50
14	1.00	1.00	1.00	1.00	1.00	2.77	1.24	.85	.50	.35	.50	.50
15	1.12	1.00	1.00	1.00	1.00	2.60	1.00	.85	.50	.35	.50	.50
16	1.24	1.00	1.00	1.00	1.00	2.43	1.00	.75	.45	.45	.50	.45
17	1.12	1.00	1.00	1.00	11	2.11	1.00	.85	.25	.45	.50	.35
18	1.12	1.00	1.00	1.00	1.00	1.50	1.00	.85	.50	.45	.50	.35
19	1.12	1.00	1.00	1.00	1.00	1.24	1.37	.85	.65	.35	.50	.00
20	1.12	1.00	1.00	1.00	1.00	1.24	1.00	.75	.65	.35	.50	.00
21	1.00	1.00	1.00	1.00	11	1.37	1.12	.75	.50	.35	.50	.00
22	1.00	1.00	1.00	1.00	1.00	1.24	.85	.85	.50	.35	.50	.10
23	1.00	1.00	1.00	1.00	1.00	1.24	.65	.25	.50	.35	.50	.05
24	1.00	1.00	1.00	1.00	11	1.24	.45	.05	.50	.35	.50	.02
25	1.00	1.00	1.00	1.00	1.00	1.24	.75	.00	.50	14	.50	.05
26	1.00	1.00	1.00	1.00	1.00	1.12	1.12	.00	.85	.50	.50	.02
27	1.00	1.00	1.00	1.00	1.00	1.24	1.00	.00	.65	.02	.50	.00
28	1.00	1.00	1.00	1.00	1.00	1.24	.85	.00	.75	.02	.50	.02
29	1.00	1.00	1.00	1.00		1.12	.85	.00	.45	.50	.50	.00
30	.75	1.00	1.00	1.00		1.00	.55	.00	.45	.50	.50	.02
31	.85		1.00	1.00		1.00		.20		.50	.50	
MEAN	1.08	.98	1.00	1.00	2.07	1.32	1.12	.64	.72	.77	.50	.29
MAX	1.37	1.12	1.00	1.00	11	2.77	1.80	1.12	1.37	14	.50	.65
MIN	.75	.85	1.00	1.00	1.00	.75	.45		.25	.02	.50	

MEAN FOR YEAR IS: .960354

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK #1

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.37	2.11	2.10	2.00	2.00	2.00	1.80	1.12	20	15	.65	1.00
2	1.37	1.80	2.10	2.00	2.00	2.00	1.80	1.12	16	15	.65	.50
3	1.37	1.65	2.10	2.00	2.00	2.00	1.65	1.12	16	16	.65	.45
4	1.37	1.65	2.10	2.00	2.00	2.00	1.65	1.65	16	16	.65	.35
5	1.37	1.80	2.10	2.00	2.00	2.00	1.80	1.65	16	15	.50	.50
6	1.37	1.80	2.10	2.00	2.00		1.50	1.37	15	12	.45	.50
7	1.65	1.80	2.10	2.00	2.00		1.50	1.80	15	13	.45	.65
8	1.95	1.80	2.10	2.00	2.00		1.50	2.60	15	14	.45	.65
9	1.66	1.65	2.10	2.00	2.00		2.11	1.50	17	14	.45	.35
10	1.80	1.65	2.10	2.00	2.00		2.11	1.37	19	12	.45	.45
11	1.80	1.65	2.10	2.00	2.00		1.80	1.37	18	11	.45	.45
12	1.80	1.80	2.10	2.00	2.00		1.95	1.24	18	10.00	.45	.65
13	1.80	1.65	2.10	2.00	2.00		1.37	1.12	18	9.00	.45	.50
14	1.80	1.65	2.10	2.00	2.00		1.37	1.12	18	8.00	.45	.50
15	1.80	1.65	2.10	2.00	2.00		1.50	1.37	19	7.00	.65	.75
16	1.80	1.65	2.10	2.00	2.00		1.37	1.12	19	4.00	.50	.75
17	1.80	1.65	2.10	2.00	2.00		1.37	4.47	21	3.00	.65	.75
18	1.80	1.65	2.10	2.00	2.00		1.24	6.19	21	2.00	.75	1.12
19	1.80	1.65	2.10	2.00	2.00		1.37	12	20	2.00	.65	1.00
20	1.80	1.65	2.10	2.00	2.00		1.24	114	19	2.00	.50	.85
21	1.80	2.60	2.10	2.00	2.00		1.37	114	18	1.12	.50	.75
22	1.80	1.80	2.10	2.00	2.00		1.50	16	20	1.12	.50	.65
23	1.80	1.80	2.10	2.00	2.00		1.24	15	20	1.12	.50	.75
24	1.80	1.80	2.10	2.00	2.00		1.14	28	19	1.00	.50	.65
25	1.80	1.80	2.10	2.00	2.00		.50	21	21	.75	.65	1.12
26	1.80	2.27	2.10	2.00	2.00		1.24	17	20	1.12	.50	1.00
27	1.80	2.27	2.10	2.00	2.00		1.12	16	19	1.12	.50	1.12
28	1.80	1.95	2.10	2.00	2.00		1.50	15	19	.50	.65	1.12
29	1.80	1.95	2.10	2.00			1.37	15	19	.75	.75	1.12
30	1.95	2.11	2.10	2.00			1.12	18	18	.75	.75	.65
31	2.11		2.10	2.00		1.65		20		.65	.85	
MEAN	1.72	1.82	2.10	2.00	2.00	1.94	1.47	15	18	6.77	.56	.72
MAX	2.11	2.60	2.10	2.00	2.00	2.00	2.11	114	21	16	.85	1.12
MIN	1.37	1.65	2.10	2.00	2.00	1.65	.50	1.12	15	.50	.45	.35

MEAN FOR YEAR IS: 4.50728

NOTE: The high discharges recorded on May 20 and 21 may have been the result of backwater from the Tongue River.

EPA-287 (Cin.)
(4-76)

COOK CREEK #1 NEAR THE MOUTH

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.00	2.43	2.50	2.50	1.70	1.80	2.00	2.00	1.00	1.30	.50	.60
2	2.00	2.43	2.50	2.50	1.70	1.80	2.00	2.11	1.30	1.30	.50	.60
3	2.00	2.43	2.50	2.40	1.70	1.80	2.00	2.00	1.25	1.30	.50	.60
4	2.00	2.43	2.50	2.40	1.70	1.80	2.27	2.00	1.25	1.30	.50	.60
5	2.00	2.43	2.50	2.40	1.70	1.80	2.00	2.00	1.25	1.30	.50	.70
6	2.00	2.43	2.60	2.30	2.00	1.80	2.00	2.00	1.25	12	.50	.70
7	2.00	2.43	2.60	2.30	2.00	1.80	2.00	2.00	1.37	.55	.50	.70
8	2.10	2.43	2.60	2.20	2.00	1.80	2.00	2.00	1.50	.50	.50	.80
9	2.11	2.43	2.60	2.20	2.00	1.80	2.00	2.00	1.25	.50	.50	.80
10	2.11	2.43	2.60	2.10	2.00	1.80	2.00	2.00	1.37	.50	.50	.80
11	2.11	2.43	2.60	2.10	2.00	1.80	1.50	2.00	3.68	.50	.50	.90
12	2.11	2.43	2.70	2.00	2.77	1.80	1.50	2.00	2.11	.50	.50	.90
13	3.49	2.43	2.70	2.00	2.00	1.80	1.50	2.00	1.80	.50	.50	.90
14	2.43	2.43	2.70	1.90	2.00	1.80	1.50	2.00	1.50	.50	.50	1.00
15	2.43	2.43	2.70	1.90	2.00	1.80	1.50	2.00	1.50	.50	.55	1.00
16	2.43	2.43	2.80	1.80	2.00	1.80	1.30	1.60	1.50	.50	.50	1.00
17	2.77	2.43	2.80	1.80	2.00	1.80	1.30	1.60	1.25	.50	.50	1.00
18	2.77	2.43	2.80	1.70	2.00	1.80	1.30	1.60	1.25	.50	.60	1.00
19	2.95	2.43	2.80	1.60	1.95	1.80	1.30	1.60	1.25	.50	.60	1.10
20	2.43	2.43	2.80	1.50	1.95	1.80	1.30	1.60	1.25	.50	.60	1.10
21	2.60	2.43	2.95	1.50	1.95	1.80	1.20	1.50	1.37	.60	.70	1.10
22	2.60	2.43	2.90	1.50	1.95	1.80	1.20	1.50	1.37	.60	.70	1.10
23	2.77	2.43	2.90	1.50	1.95	1.80	1.20	1.50	1.37	.60	.75	1.10
24	2.77	2.60	2.90	1.50	1.95	1.75	1.20	1.50	1.37	.70	.45	1.10
25	2.95	2.60	2.90	1.50	2.00	1.80	1.20	1.50	1.37	.75	.45	1.10
26	2.60	2.11	2.80	1.70	2.00	1.80	1.20	1.50	1.37	.70	.50	1.10
27	2.60	2.43	2.80	1.70	2.00	1.80	1.25	1.50	1.37	.70	.50	1.10
28	2.43	2.50	2.80	1.70	2.00	1.80	1.37	1.50	1.37	.70	.50	1.20
29	2.60	2.50	2.80	1.70		1.80	1.75	1.40	1.37	.70	.50	1.20
30	2.43	2.50	2.80	1.70		1.80	1.80	1.40	1.37	.70	.50	1.20
31	2.43		2.70	1.70		1.80		1.30		.70	.50	
MEAN	2.42	2.43	2.71	1.91	1.96	1.79	1.58	1.74	1.45	1.06	.52	.93
MAX	3.49	2.60	2.95	2.50	2.77	1.80	2.27	2.11	3.68	12	.75	1.20
MIN	2.00	2.11	2.50	1.50	1.70	1.75	1.20	1.30	1.00	.50	.45	.60

MEAN FOR YEAR IS: 1.71414

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 1 of 7

DATE		120575	012376	030176	031776	042176
POTASSIUM	PPM	16.00	8.00	8.00	11.00	12.00
SODIUM	PPM	180	191	188	179	180
CALCIUM	PPM	88.00	88.00	86.00	78.00	78.00
MAGNESIUM	PPM	115	107	106	102	101
SULFATE	PPM	578	530	505	453	500
CHLORIDE	PPM	10.00	3.00	5.00	8.00	7.00
CARBONATE	PPM	0.00	0.00	24.00	0.00	12.00
BICARBONATE	PPM	622	641	580	604	573
FLOURIDE	PPM	1.30	1.20	1.20	1.20	1.10
SILICON DIO	PPM	16.00	19.00	13.00	17.00	12.00
TOTAL P	PPM	0.08	0.33	0.05	0.10	0.10
NITRATE	PPM	2.50	3.00	2.00	1.00	1.00
POTASSIUM	EPM	0.41	0.20	0.20	0.28	0.31
SODIUM	EPM	7.83	8.31	8.18	7.79	7.83
CALCIUM	EPM	4.39	4.39	4.29	3.89	3.89
MAGNESIUM	EPM	9.46	8.80	8.72	8.39	8.31
SULFATE	EPM	12.03	11.03	10.51	9.43	10.41
CHLORIDE	EPM	0.28	0.08	0.14	0.23	0.20
CARBONATE	EPM	0.00	0.00	0.80	0.00	0.40
BICARBONATE	EPM	10.19	10.51	9.51	9.90	9.39
FLOURIDE	EPM	0.07	0.06	0.06	0.06	0.06
NITRATE	EPM	0.00	0.01	0.00	0.00	0.00
TOTAL CATIONS		22.09	21.71	21.39	20.35	20.34
TOTAL ANIONS		22.51	21.67	20.99	19.56	20.40
DEVIATION		102	99.84	98.11	96.11	100
TDS (calc.)		1309	1242	1207	1128	1172
TDS @180		1338	1319	1226	1222	1236
TOTAL HARDNESS		694	659	649	612	610
ALKALINITY		510	525	515	495	490
NON-CARB HARD		184	134	134	117	120
LAB CONDUCTIVITY		1639	1750	1750	1700	1750
FIELD COND.						
LAB pH		8.10	8.10	8.50	8.10	8.30
FIELD pH		6.70	7.20	6.90	7.40	

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 2 of 7

DATE		052776	070676	070876	072776	090276
POTASSIUM	PPM	12.00	31.00	10.00	11.00	20.00
SODIUM	PPM	197	197	197	194	200
CALCIUM	PPM	84.00	40.00	80.00	103	189
MAGNESIUM	PPM	107	131	107	96.00	54.00
SULFATE	PPM	516	498	506	505	548
CHLORIDE	PPM	9.00	7.00	5.00	11.00	5.00
CARBONATE	PPM	0.00	54.00	60.00	18.00	0.00
BICARBONATE	PPM	689	549	525	665	708
FLOURIDE	PPM	1.20	1.00	1.20	1.10	1.50
SILICON DIO	PPM	17.00	19.00	19.00	22.00	18.00
TOTAL P	PPM	0.20	0.07	0.04	0.11	0.03
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.31	0.79	0.26	0.28	0.51
SODIUM	EPM	8.57	8.57	8.57	8.44	8.70
CALCIUM	EPM	4.19	2.00	3.99	5.14	9.43
MAGNESIUM	EPM	8.80	10.78	8.80	7.90	4.44
SULFATE	EPM	10.74	10.37	10.53	10.51	11.41
CHLORIDE	EPM	0.25	0.20	0.14	0.31	0.14
CARBONATE	EPM	0.00	1.80	2.00	0.60	0.00
BICARBONATE	EPM	11.29	9.00	8.60	10.90	11.60
FLOURIDE	EPM	0.06	0.05	0.06	0.06	0.08
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		21.87	22.13	21.62	21.76	23.08
TOTAL ANIONS		22.29	21.37	21.31	22.30	23.20
DEVIATION		102	96.53	98.56	103	100
TDS (calc.)		1264	1228	1223	1265	1364
TDS @180		1306	1225	1277	1288	1406
TOTAL HARDNESS		649	638	639	651	691
ALKALINITY		565	540	530	575	580
NON-CARB HARD		84.00	98.00	109	76.00	111
LAB CONDUCTIVITY		1800	2000	2100	1800	1700
FIELD COND.						
LAB pH		7.70	8.30	8.20	8.10	8.20
FIELD pH		7.10	6.70		7.90	7.30

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 3 of 7

DATE		091576	102076	102076	111876	122176
POTASSIUM	PPM	21.00	15.00	15.00	12.00	11.00
SODIUM	PPM	212	200	200	188	180
CALCIUM	PPM	104	224	224	134	130
MAGNESIUM	PPM	98.00	29.00	29.00	76.00	84.00
SULFATE	PPM	530	579	579	506	534
CHLORIDE	PPM	9.00	14.00	14.00	11.00	8.00
CARBONATE	PPM	0.00	24.00	24.00	60.00	0.00
BICARBONATE	PPM	695	573	573	500	659
FLOURIDE	PPM	1.40	1.10	1.10	1.00	1.10
SILICON DIO	PPM	26.00	21.00	21.00	17.00	21.00
TOTAL P	PPM	0.13	0.04	0.04	0.19	0.01
NITRATE	PPM	1.00	2.00	2.00	1.00	1.00
POTASSIUM	EPM	0.54	0.38	0.38	0.31	0.28
SODIUM	EPM	9.22	8.70	8.70	8.18	7.83
CALCIUM	EPM	5.19	11.18	11.18	6.69	6.49
MAGNESIUM	EPM	8.06	2.39	2.39	6.25	6.91
SULFATE	EPM	11.03	12.05	12.05	10.53	11.12
CHLORIDE	EPM	0.25	0.39	0.39	0.31	0.23
CARBONATE	EPM	0.00	0.80	0.80	2.00	0.00
BICARBONATE	EPM	11.39	9.39	9.39	8.19	10.80
FLOURIDE	EPM	0.07	0.06	0.06	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		23.01	22.65	22.65	21.42	21.51
TOTAL ANIONS		22.69	22.60	22.60	21.01	22.14
DEVIATION		98.60	99.78	99.78	98.09	103
TDS (calc.)		1316	1367	1367	1233	1271
TDS @180		1383	1309	1309	1254	1319
TOTAL HARDNESS		664	677	677	645	669
ALKALINITY		570	510	510	510	540
NON-CARB HARD		94.00	167	167	135	129
LAB CONDUCTIVITY		1900	1650	1650	1700	1900
FIELD COND.						
LAB pH		8.20	8.00	8.00	8.20	8.10
FIELD pH		7.00	7.70	7.70	7.90	7.10

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 4 of 7

DATE		012077	022277	032477	040477	050277
POTASSIUM	PPM	11.00	2.00	14.00	20.00	15.00
SODIUM	PPM	210	170	180	180	190
CALCIUM	PPM	102	164	127	133	82.00
MAGNESIUM	PPM	91.00	48.00	74.00	62.00	100.00
SULFATE	PPM	508	482	475	458	482
CHLORIDE	PPM	12.00	10.00	9.00	10.00	8.00
CARBONATE	PPM	0.00	0.00	36.00	36.00	48.00
BICARBONATE	PPM	634	561	525	512	549
FLOURIDE	PPM	1.10	1.00	1.10	1.10	1.20
SILICON DIO	PPM	22.00	18.00	16.00	16.00	15.00
TOTAL P	PPM	0.23	0.04	0.20	0.04	0.02
NITRATE	PPM	2.00	1.00	0.30	0.90	0.25
POTASSIUM	EPM	0.28	0.05	0.36	0.51	0.38
SODIUM	EPM	9.13	7.39	7.83	7.83	8.26
CALCIUM	EPM	5.09	8.18	6.34	6.64	4.09
MAGNESIUM	EPM	7.49	3.95	6.09	5.10	8.23
SULFATE	EPM	10.58	10.04	9.89	9.54	10.04
CHLORIDE	EPM	0.34	0.28	0.25	0.28	0.23
CARBONATE	EPM	0.00	0.00	1.20	1.20	1.60
BICARBONATE	EPM	10.39	9.19	8.60	8.39	9.00
FLOURIDE	EPM	0.06	0.05	0.06	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		21.99	19.58	20.61	20.08	20.97
TOTAL ANIONS		21.28	19.49	19.94	19.39	20.86
DEVIATION		96.76	99.56	96.75	96.59	99.51
TDS (calc.)		1246	1152	1173	1151	1195
TDS @180		1273	1176	1166	1169	1201
TOTAL HARDNESS		629	606	619	585	616
ALKALINITY		520	460	490	480	530
NON-CARB HARD		109	146	129	105	86.00
LAB CONDUCTIVITY		1640	1650	1700	1670	1634
FIELD COND.						
LAB pH		8.20	8.30	8.30	8.30	8.30
FIELD pH		8.00		6.20	8.20	8.20

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 5 of 7

DATE		052677	062077	072577	082377	101177
POTASSIUM	PPM	15.00	14.00	14.00	23.00	24.00
SODIUM	PPM	190	180	200	210	210
CALCIUM	PPM	85.00	106	132	83.00	74.00
MAGNESIUM	PPM	104	87.00	82.00	109	112
SULFATE	PPM	487	486	523	510	510
CHLORIDE	PPM	18.00	8.00	10.00	12.00	13.00
CARBONATE	PPM	60.00	42.00	54.00	12.00	36.00
BICARBONATE	PPM	512	580	555	659	610
FLOURIDE	PPM	1.20	1.10	1.20	1.20	1.10
SILICON DIO	PPM	21.00	33.00	27.00	23.00	22.00
TOTAL P	PPM	0.01	0.17	0.10	0.03	0.07
NITRATE	PPM	0.55	0.40	0.10	0.10	0.60
POTASSIUM	EPM	0.38	0.36	0.36	0.59	0.61
SODIUM	EPM	8.26	7.83	8.70	9.13	9.13
CALCIUM	EPM	4.24	5.29	6.59	4.14	3.69
MAGNESIUM	EPM	8.56	7.16	6.75	8.97	9.21
SULFATE	EPM	10.14	10.12	10.89	10.62	10.62
CHLORIDE	EPM	0.51	0.23	0.28	0.34	0.37
CARBONATE	EPM	2.00	1.40	1.80	0.40	1.20
BICARBONATE	EPM	8.39	9.51	9.10	10.80	10.00
FLOURIDE	EPM	0.06	0.06	0.06	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		21.45	20.63	22.39	22.83	22.65
TOTAL ANIONS		20.97	21.25	22.06	22.13	22.15
DEVIATION		97.78	103	98.52	96.94	97.75
TDS (calc.)		1211	1208	1288	1283	1279
TDS @180		1228	1251	1330	1296	1287
TOTAL HARDNESS		639	625	664	653	644
ALKALINITY		520	545	545	560	560
NON-CARB HARD		119	80.00	119	93.00	84.00
LAB CONDUCTIVITY		1133	1746	1744	1728	1813
FIELD COND.					1500	1200
LAB pH		8.30	8.30	8.50	8.40	8.40
FIELD pH		8.40		8.30	8.45	

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 6 of 7

DATE		032979	050879
POTASSIUM	PPM	7.00	15.00
SODIUM	PPM	65.00	194
CALCIUM	PPM	85.00	113
MAGNESIUM	PPM	58.00	97.00
SULFATE	PPM	323	571
CHLORIDE	PPM	11.00	13.00
CARBONATE	PPM	0.00	0.00
BICARBONATE	PPM	317	671
FLOURIDE	PPM		
SILICON DIO	PPM		
TOTAL P	PPM	0.06	0.75
NITRATE	PPM	0.12	0.10
POTASSIUM	EPM	0.18	0.38
SODIUM	EPM	2.83	8.44
CALCIUM	EPM	4.24	5.64
MAGNESIUM	EPM	4.77	7.98
SULFATE	EPM	6.72	11.89
CHLORIDE	EPM	0.31	0.37
CARBONATE	EPM	0.00	0.00
BICARBONATE	EPM	5.20	11.00
FLOURIDE	EPM		
NITRATE	EPM	0.00	0.01
TOTAL CATIONS		12.02	22.44
TOTAL ANIONS		64.74	75.76
DEVIATION		539	338
TDS (calc.)		705	1333
TDS @180		652	1312
TOTAL HARDNESS		451	682
ALKALINITY		260	550
NON-CARB HARD		191	132
LAB CONDUCTIVITY		960	1250
FIELD COND.			
LAB pH		8.10	8.20
FIELD pH			

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

COOK CREEK AT THE WEIR 7 of 7

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	14.33	34.30	27.00
SODIUM	PPM	187	698	27.00
CALCIUM	PPM	112	1913	27.00
MAGNESIUM	PPM	87.63	656	27.00
SULFATE	PPM	507	2435	27.00
CHLORIDE	PPM	9.63	10.46	27.00
CARBONATE	PPM	22.22	504	27.00
BICARBONATE	PPM	587	6373	27.00
FLOURIDE	PPM	1.16	0.01	25.00
SILICON DIO	PPM	19.64	19.99	25.00
TOTAL P	PPM	0.10	0.02	27.00
NITRATE	PPM	0.35	1.51	27.00
POTASSIUM	EPM	0.37		
SODIUM	EPM	8.16		
CALCIUM	EPM	5.57		
MAGNESIUM	EPM	7.21		
SULFATE	EPM	10.55		
CHLORIDE	EPM	0.27		
CARBONATE	EPM	0.74		
BICARBONATE	EPM	9.62		
FLOURIDE	EPM	0.06		
NITRATE	EPM	0.00		
TOTAL CATIONS		21.30	4.17	27.00
TOTAL ANIONS		25.06	167	27.00
DEVIATION		124	8633	27.00
TDS (calc.)		1229	14829	27.00
TDS @180		1250	17318	27.00
TOTAL HARDNESS		638	2065	27.00
ALKALINITY		518	3447	27.00
NON-CARB HARD		120	922	27.00
LAB CONDUCTIVITY		1684	54055	27.00
FIELD COND.		1350	22500	2.00
LAB pH		8.21	0.03	27.00
FIELD pH		7.52	0.40	20.00

8-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WATER YEAR 1979

TONGUE RIVER #2 AT THE SOUTHERN RESERVATION BOUNDARY

STATION DESCRIPTION

Culvert gaging house, Leopold Stevens A-71 recorder with float, outside cantilever staff gage and cableway. The station is located south of the Northern Cheyenne Reservation in Section 36, T. 5 S., R. 42 E., on the 3 Circle Ranch on the left bank at River Mile 151.8 in Rosebud County.

PERIOD OF OPERATION

April 1976 to September 1979 when station was moved to river mile 143.9. The station was previously operated by the State of Montana during the irrigation season, April to October, in water years 1967 to 1973.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 30 cfs, June 25, 1976.
Maximum daily discharge, 9484 cfs, May 20,1979.

STAGE DISCHARGE CURVE

The stage discharge relationship used was defined by measurements taken since the flood of May 1978. After the flood, the channel was about 1.3 feet lower than previously. More channel scouring and filling occured in the spring of this year, and during the summer the channel was filling. Because of channel instabilities, the stage discharge relationship is not well defined.

Prior to May 22,1979, the following relationship based on five measurements was used to compute flows:

$$\log(Q) = \log(\text{stage})*0.86687 + 6.19934 \qquad r=.998$$

After May 22, the stage discharge curve was concave downward and was approximated by two linear portions:

$$\log(Q) = \log(\text{stage})*0.807143 + 6.09968 \quad r=.998 \quad \text{(four measurements)}$$

$$\log(Q) = \log(\text{stage})*1.38331 + 6.07238 \quad r=.999 \text{ (six measurements)}$$

MALFUNCTIONS AND MISSING RECORDS

The float was frozen from January 13 to March 5, and from March 22 to March 28.

BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
(4-76)

INTERPRETATION NOTES

The winter flow of the river was regulated by releases from the Tongue River Dam. Because of the thick ice cover during the winter, it was not possible to accurately calculate daily discharges from the stage levels. Daily discharges were calculated from a relationship developed from the know pattern of dam releases, four discharge measurements taken by the USGS below the dam during the winter, from five discharge measurements taken at the station, five discharge measurements taken at Tongue River #1, and the changes in stage. Linear interpolation was used between known points.

During the spring thaw, March 4 to March 21, discharges were computed from a stage discharge relationship developed from two measurements during March. Linear interpolation was used to compute daily flows between March 21 and March 27.

DATUM

Datum is the outside stage on September 25,1979 minus 1.76 feet. The outside stage settled 0.16 feet during early April. This datum is 0.33 feet higher than the datum used for water year 1976-1978. This adjustment was made so that negative stages would not occur.

EPA-287 (Cin.)
(4-76)

TONGUE RIVER #2

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	380	131	356	308	262	235	311	412	1687	630	427	526
2	380	126	404	306	262	234	304	303	1696	663	427	526
3	380	131	452	304	261	232	302	469	1609	663	427	526
4	380	126	500	302	260	231	309	485	1506	558	420	519
5	380	126	500	300	259	230	311	542	1372	551	416	519
6	380	126	500	298	259	250	300	541	1226	551	409	519
7	380	126	500	296	258	250	297	539	1244	558	409	513
8	380	126	500	294	257	250	286	537	1246	551	409	513
9	380	126	500	292	256	258	284	536	1256	571	402	513
10	238	126	500	290	256	240	282	547	1250	456	402	513
11	199	126	500	288	255	226	295	545	1141	449	402	501
12	159	126	500	286	254	229	293	535	959	456	409	507
13	131	126	447	284	253	229	292	533	595	452	409	501
14	131	126	431	282	253	229	299	535	532	452	379	494
15	131	126	415	280	252	229	303	534	527	434	379	488
16	131	126	399	278	251	229	305	532	529	442	376	438
17	136	126	383	276	251	229	307	535	524	442	427	416
18	137	126	367	273	250	229	314	529	519	438	482	413
19	126	126	351	272	249	229	325	527	546	427	494	413
20	126	126	335	271	248	229	336	529	528	427	494	359
21	126	126	331	271	248	240	325	532	523	427	513	359
22	126	126	328	270	243	251	327	488	518	460	513	359
23	131	126	326	269	242	262	333	513	514	501	507	305
24	131	126	324	268	241	273	335	526	515	526	507	293
25	131	156	322	268	240	284	334	781	510	488	519	267
26	131	167	320	267	239	295	341	925	505	464	538	260
27	131	178	318	266	238	306	335	963	513	464	513	260
28	131	189	316	265	237	317	324	1061	610	464	513	260
29	131	200	314	265		323	411	1069	616	867	532	260
30	131	308	312	264		320	410	1274	623	482	532	260
31	131		310	263		314		1617		445	526	
MEAN	209	141	399	281	251	254	318	645	865	508	455	420
MAX	380	308	500	308	262	323	411	1617	1696	867	538	526
MIN	126	126	310	263	237	226	282	303	505	427	376	260

MEAN FOR YEAR IS: 396

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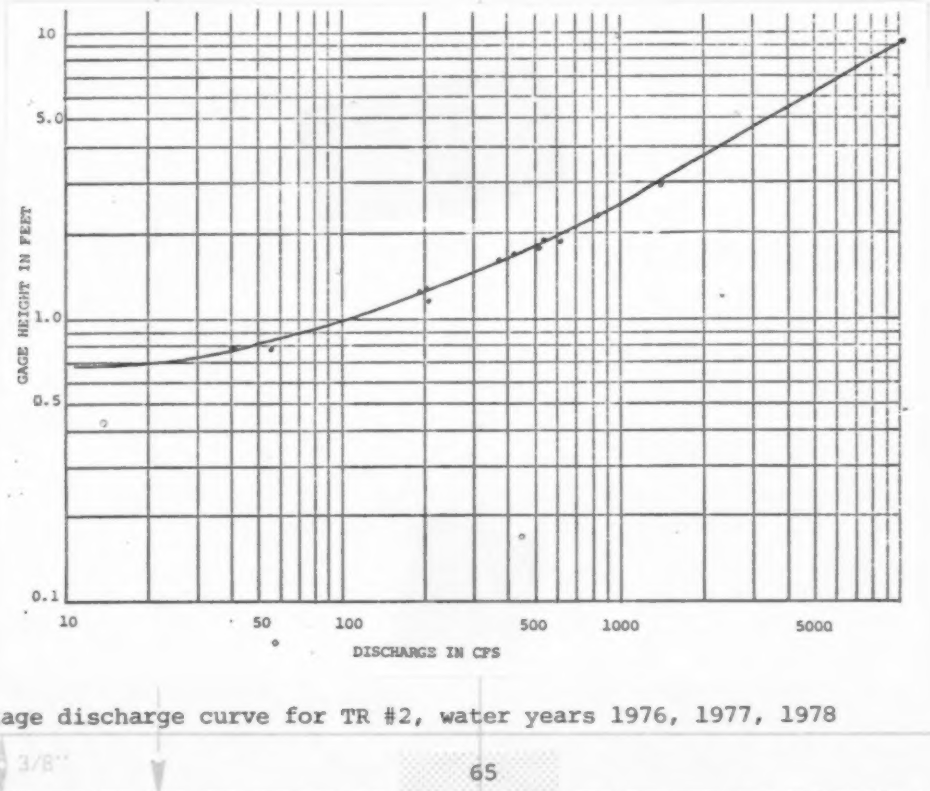
TONGUE RIVER #2 -- WATER YEARS 1976,1977,1978

Current meter measurements at the TR#2 cross section were started and the outside staff gage installed in October 1975. Intermittant measurements were made from that date until April 12,1976 when the continuous level recorder was installed. Daily records are available for most periods since that date. The recorder pen was set equal to the outside gage initially and was used as the primary reference gage throughout water years 1976-1978. The outside gage shifted several times due to settling and warping of the wooden horizontal arm. A new outside gage was installed March 28,1978. This gage was undercut during the May 1978 flood and was replaced by a new staff gage on October 9,1978.

6-1/2"

The stage discharge curve was defined from 20 measurements taken during water years 1976-1978. The curve is concave upward on its lower end, and approximates a straight line on its upper end. It was fitted by eye to the data, and agreed closely with a rating curve developed by the Montana Department of Natural Resources and Conservation from 1972-1973 measurements at the TR#2 site.



Stage discharge curve for TR #2, water years 1976, 1977, 1978

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	201	213	165	177	185		569	623				
2	193	197	165	177	185		683	623				
3	193	170	165	177	185		647	683				
4	193	160	165	177	185		665	701				
5	205	160	165	177	185		659	865				
6	230	160	165	177	185		645	872				
7	201	155	165	177			635	935				
8	217	165	165	177			635	1005	3024			
9	213	155	165	177			629	1225				
10	217	155	165	177		205	629	1450				
11	209	155	165	177			629	1585				
12	209	155	165	181			629	1570				
13	185	155	165	181			629	1555				
14	140	155	165	181			629	1547				
15	201	155	165	181			629	1525				
16	201	160	165	181			617	1533				
17	204	155	165	181			617	1592				
18	205	165	165	181			617	2500				
19	205	165	173	181			617	4600				
20	205	165	173	181			605	9484				
21	205	165	173	181			605	8106				
22	205	140	173	181		390	611	6840				
23	205	185	173	181		390	605	4460				
24	205	165	173	185		390	589	5000				
25	205	165	173	185		385	589	4544				
26	205	185	173	185		380	589	4292				
27	209	165	173	185		375	589	4222				
28	209	165	173	185	246	380	611	4110				
29	209	165	173	185		385	605	3684				
30	213	165	173	185		509	605	3900				
31	217		173	185		569		3998				
MEAN	204	165	168	181	194	396	620	2891	3024			
MAX	230	213	173	185	246	569	683	9484	3024			
MIN	140	140	165	177	185	205	569	623	3024			

MEAN FOR YEAR IS: 871

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TONGUE RIVER #2

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	385	250	230	197	180	100	325	907	1054	545	395	313
2	295	250	230	205	180	100	325	900	921	542	395	295
3	285	250	165	230	170	98	325	1005	921	521	385	295
4	285	250	100	250	170	97	325	1075	921	515	410	295
5	285	250	90	250	165	94	325	1165	984	551	425	301
6	285	250	80	250	165	94	325	1300	1061	563	405	301
7	285	250	100	295	165	92	325	1300	1082	521	400	295
8	265	250	120	275	165	92	325	1300	1263	509	405	291
9	275	250	100	250	161	92	442	1308	1300	509	405	295
10	275	250	90	275	157	92	545	1330	1495	521	420	291
11	275	250	90	265	157	92	605	1345	1555	521	420	291
12	275	250	140	255	150	92	704	1675	1465	521	430	291
13	275	250	120	250	150	92	711	1900	1353	521	430	283
14	275	250	120	242	150	92	711	1840	1307	515	430	283
15	275	250	120	230	150	92	698	1900	1158	521	430	275
16	275	250	140	230	145	92	698	1975	1075	466	420	185
17	275	242	140	217	145	92	635	2087	1012	466	420	140
18	275	165	140	205	140	140	575	2110	1047	485	420	140
19	185	165	140	201	140	209	515	2050	970	497	415	140
20	255	165	140	201	135	209	515	1847	763	497	337	140
21	250	165	140	207	130	209	515	1488	187	497	325	145
22	250	165	140	203	130	209	515	1437	78	497	325	140
23	250	165	189	185	125	209	515	1300	40	497	325	132
24	250	165	205	185	120	209	515	1075	36	497	320	132
25	250	165	242	185	120	209	515	1012	30	497	325	136
26	250	165	230	185	115	209	515	865	900	515	325	136
27	250	165	250	185	115	305	635	872	1070	503	325	140
28	250	205	242	185	110	305	635	886	977	454	319	140
29	250	250	242	185		305	641	1187	605	454	319	140
30	250	275	213	185		325	907	1054	551	400	319	165
31	250		193	185		325		1061		395	313	
MEAN	268	221	157	221	147	160	529	1373	906	500	379	218
MAX	385	275	250	295	180	325	907	2110	1555	563	430	313
MIN	185	165	80	185	110	92	325	865	30	395	313	132

MEAN FOR YEAR IS: 423

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1976

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	245							448	1033	698	527	375
2								448	1263	743	527	375
3								460	1300	698	515	380
4								521	1375	698	515	385
5								521	1375	730	515	385
6		40						527	1427	795	509	385
7								527	1525	827	503	390
8								527	1630	763	497	385
9	245							527	1825	635	497	385
10								527	1915	551	497	385
11								698	1825	545	497	385
12							375	698	1735	545	490	390
13							375	698	1600	545	485	395
14							380	698	1437	545	485	390
15							390	698	1397	545	485	390
16	156						395	698	1375	539	490	390
17							395	698	1345	539	490	390
18							390	704	1353	539	497	390
19							390	711	1353	545	503	385
20							390	717	1353	533	490	385
21							448	730	1353	527	490	385
22							454	750	1353	527	490	380
23							448	756	1353	521	490	380
24	173						448	763	1337	490	509	385
25							436	769	1337	430	509	385
26							442	775	1337	430	509	385
27							473	795	1337	485	430	385
28							509	815	1150	545	365	385
29							490	873	1005	485	375	385
30							472	1005	763	527	375	385
31								1033		533	375	
MEAN	205	40					426	681	1392	583	482	385
MAX	245	40					509	1033	1915	827	527	395
MIN	156	40					375	448	763	430	365	375

MEAN FOR YEAR IS: 524

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 16	OCT 31	NOV 3	DEC 20	MAR 11	MAR 29	APR 9	APR 25
DISCHARGE......	134	128	132	338	229	322	302	355
GAGE HEIGHT....	1.78	1.79	1.81	3.66	4.15	2.16	2.13	2.28
ADJ. GAGE HT...		0.18	0.19	2.07	2.55	0.56	0.53	0.57
WIDTH..........	98	81	92	109	100	105	112	102
AREA...........	130	108	115	211	159	165	173	194
MEAN DEPTH.....	1.33	1.32	1.25	1.84	1.58	1.57	1.55	1.90
MEAN VELOCITY..	1.03	1.19	1.15	1.68	1.45	1.95	1.74	1.83
# OF SECTIONS..	25	20	27	22	7.00	23	27	29
CHANGE IN G.HT.		0.02		0.01		0.01		
TIME...........	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00
TEMPERATURE....	11	2.00	66	0.10	0.10	3.00	9.00	9.00
METER TYPE.....	AA	AA	AA	PYG	PYG	PYG	AA	AA
FREE OR ICE....				ICE	ICE	ICE		
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	JWM	JWM	TJO	CBA	JWM

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TONGUE RIVER #2 NEAR BIRNEY 2

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	MAY 22	MAY 31	JUN 7	JUN 14	JUN 27	JUL 10	JUL 18	AUG 29
DISCHARGE......	513	1619	1270	560	544	449	432	506
GAGE HEIGHT....	2.85	4.40	3.90	2.84	2.88	2.80	2.78	2.99
ADJ. GAGE HT...	1.09	2.64	2.13	1.08	1.14	1.03	1.02	1.13
WIDTH..........	112	131	114	115	118	115	115	118
AREA...........	235	455	379	238	241	228	227	247
MEAN DEPTH.....	2.10	3.47		2.07	2.26	1.97	1.97	2.09
MEAN VELOCITY..	2.18	3.56	3.35	2.35	2.04	1.98	1.74	2.11
# OF SECTIONS..	30		29	30	28	26	21	27
CHANGE IN G.HT.	0.02		0.02			0.01		
TIME...........	1.30	6.00	3.00	2.00	2.00	2.20	2.00	2.00
TEMPERATURE....			10	17	22		22	
METER TYPE.....	AA	AA	AA	AA	AA	AA	AA	AA
FREE OR ICE....								
SUSPENSION.....	ROD	CAB	CAB	ROD	ROD	ROD	DCA	DCA
GAGED BY.......	JWM	TJO	TJO	TJO	TJO	TJO	JWM	JWM

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	SEP 25
DISCHARGE......	266
GAGE HEIGHT....	2.29
ADJ. GAGE HT...	0.53
WIDTH..........	106
AREA...........	169
MEAN DEPTH.....	1.60
MEAN VELOCITY..	1.45
# OF SECTIONS..	21
CHANGE IN G.HT.	0.02
TIME...........	1.00
TEMPERATURE....	16
METER TYPE.....	AA
FREE OR ICE....	
SUSPENSION.....	ROD
GAGED BY.......	JWM

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TONGUE RIVER #2

WATER YEAR 1978

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE............	NOV 2	FEB 3	MAY 20 *
DISCHARGE......	190	186	10237
GAGE HEIGHT....	2.09	3.19	
ADJ. GAGE HT...	1.23	0.76	9.52
WIDTH..........	125	114	141
AREA...........	124	142	1390
MEAN DEPTH.....	0.99	1.24	9.86
MEAN VELOCITY..	1.53	1.31	7.36
# OF SECTIONS..	33	25	13
CHANGE IN G.HT.	0.02		
TIME...........			
TEMPERATURE....	6.00	0.10	
METER TYPE.....		PYG	AA
FREE OR ICE....		ICE	
SUSPENSION.....	ROD	ROD	CAB
GAGED BY.......	TJO	TJO	TJO

* Measurement taken at the Birney Day School Bridge.

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE	OCT 19	NOV 18	DEC 15	JAN 24	FEB 19	MAR 18	APR 25	JUN 8
DISCHARGE	151	203	158	195	224	94	621	1027
GAGE HEIGHT	1.46	1.58	2.04	2.66	2.76	1.42	2.42	3.86
ADJ. GAGE HT	1.03	1.15	1.05		1.25	1.10	1.85	2.95
WIDTH	115	120	121	122	116	96	128	142
AREA	73	160	141	145	157	54	195	292
MEAN DEPTH	0.64	1.33	1.12	1.19	1.35	0.56	1.52	2.05
MEAN VELOCITY	2.06	1.26	1.16	1.35	1.93	1.75	3.19	3.51
# OF SECTIONS	24	27	27	12	18	23	31	28
CHANGE IN G.HT.								
TIME	2.00	2.00	2.00					
TEMPERATURE		10		0.10	0.10			
METER TYPE	AA	AA	PYG	PYG	PYG	AA	AA	AA
FREE OR ICE			ICE	ICE	ICE			
SUSPENSION	ROD	ROD	ROD	ROD	ROD	ROD	ROD	CAB
GAGED BY	TJO	TJO	TJO	TJO	TJO	TJO	WSE	TJO

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TONGUE RIVER #2 NEAR BIRNEY

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUL 7	AUG 15	SEP 13
DISCHARGE......	538	414	200
GAGE HEIGHT....		2.62	2.23
ADJ. GAGE HT...	1.86	1.70	1.25
WIDTH..........	124	126	125
AREA...........	182	168	132
MEAN DEPTH.....	1.47	1.33	1.06
MEAN VELOCITY..	2.95	2.47	1.52
# OF SECTIONS..	25	27	29
CHANGE IN G.HT.			
TIME...........			
TEMPERATURE....	23	21	10
METER TYPE.....	AA	AA	AA
FREE OR ICE....			
SUSPENSION.....	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO

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TONGUE RIVER #2

WATER YEAR 1976

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUL 7	JUL 22	AUG 17	SEP 15
DISCHARGE......	846	536	515	360
GAGE HEIGHT....	2.54	2.28	2.27	2.08
ADJ. GAGE HT...	2.32	1.87	1.81	1.63
WIDTH..........	127	126	127	126
AREA...........	262	199	185	151
MEAN DEPTH.....	2.06	1.57	1.45	1.20
MEAN VELOCITY..	3.23	2.69	2.78	2.39
# OF SECTIONS..	28	28	28	28
CHANGE IN G.HT. TIME...........	1.50	1.50	1.50	2.00
TEMPERATURE....	24			
METER TYPE.....	AA	AA	AA	AA
FREE OR ICE....				
SUSPENSION.....	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	TJO

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TONGUE RIVER #2 1 of 7

DATE		120575	012376	030176	031776	042176
POTASSIUM	PPM	5.00	5.00	5.00	5.00	4.00
SODIUM	PPM	47.00	50.00	57.00	60.00	53.00
CALCIUM	PPM	72.00	81.00	79.00	80.00	72.00
MAGNESIUM	PPM	52.00	52.00	56.00	55.00	47.00
SULFATE	PPM	252	253	270	269	244
CHLORIDE	PPM	66.00	5.00	6.00	6.00	4.00
CARBONATE	PPM	6.00	0.00	24.00	0.00	24.00
BICARBONATE	PPM	293	329	311	336	244
FLOURIDE	PPM	0.50	0.30	0.30	0.50	0.30
SILICON DIO	PPM	2.00	15.00	17.00	10.00	3.00
TOTAL P	PPM	0.11	0.03	0.02	0.10	0.10
NITRATE	PPM	0.10	0.10	1.00	1.00	1.00
POTASSIUM	EPM	0.13	0.13	0.13	0.13	0.10
SODIUM	EPM	2.04	2.18	2.48	2.61	2.31
CALCIUM	EPM	3.59	4.04	3.94	3.99	3.59
MAGNESIUM	EPM	4.28	4.28	4.61	4.52	3.87
SULFATE	EPM	5.25	5.27	5.62	5.60	5.08
CHLORIDE	EPM	1.86	0.14	0.17	0.17	0.11
CARBONATE	EPM	0.20	0.00	0.80	0.00	0.80
BICARBONATE	EPM	4.80	5.39	5.10	5.51	4.00
FLOURIDE	EPM	0.03	0.02	0.02	0.03	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		10.04	10.62	11.16	11.25	9.87
TOTAL ANIONS		11.65	10.78	11.66	11.26	9.98
DEVIATION		116	101	105	100	101
TDS (calc.)		584	608	650	640	568
TDS @180		608	634	671	674	598
TOTAL HARDNESS		392	415	427	427	373
ALKALINITY		250	270	295	275	240
NON-CARB HARD		142	145	132	125	133
LAB CONDUCTIVITY		775	910	970	1000	900
FIELD COND.						
LAB pH		8.30	8.10	8.90	7.80	8.40
FIELD pH		5.80	7.00	6.30	7.80	

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TONGUE RIVER #2 2 of 7

DATE		052776	070676	072776	072776	090276
POTASSIUM	PPM	3.00	2.00	2.00	2.00	5.00
SODIUM	PPM	39.00	15.00	19.00	20.00	32.00
CALCIUM	PPM	67.00	37.00	34.00	37.00	54.00
MAGNESIUM	PPM	34.00	15.00	17.00	19.00	27.00
SULFATE	PPM	180	50.00	77.00	69.00	145
CHLORIDE	PPM	5.00	2.00	2.00	5.00	7.00
CARBONATE	PPM	0.00	6.00	2.00	7.00	24.00
BICARBONATE	PPM	232	140	132	135	367
FLOURIDE	PPM	0.30	0.20	0.20	0.20	0.30
SILICON DIO	PPM	2.00	4.00	5.00	3.00	5.00
TOTAL P	PPM	0.10	0.04	0.02	0.02	0.02
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.08	0.05	0.05	0.05	0.13
SODIUM	EPM	1.70	0.65	0.83	0.87	1.39
CALCIUM	EPM	3.34	1.85	1.70	1.85	2.69
MAGNESIUM	EPM	2.80	1.23	1.40	1.56	2.22
SULFATE	EPM	3.75	1.04	1.60	1.44	3.02
CHLORIDE	EPM	0.14	0.06	0.06	0.14	0.20
CARBONATE	EPM	0.00	0.20	0.07	0.23	0.80
BICARBONATE	EPM	3.80	2.29	2.16	2.21	6.02
FLOURIDE	EPM	0.02	0.01	0.01	0.01	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		7.91	3.78	3.97	4.33	6.44
TOTAL ANIONS		7.67	3.59	3.89	4.00	10.00
DEVIATION		96.90	94.83	97.81	92.31	155
TDS (calc.)		442	196	218	226	367
TDS @180		488	220	213	244	384
TOTAL HARDNESS		306	153	155	169	244
ALKALINITY		190	125	112	123	161
NON-CARB HARD		116	28.00	43.00	46.00	83.00
LAB CONDUCTIVITY		700	400	490	400	470
FIELD COND.						
LAB pH		7.80	8.50	8.60	8.40	9.60
FIELD pH		7.40	7.80	8.00	8.80	8.50

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
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(4-76)

TONGUE RIVER #2 3 of 7

DATE		090276	091576	102076	111876	122176
POTASSIUM	PPM	5.00	4.00	5.00	4.00	3.00
SODIUM	PPM	32.00	30.00	40.00	43.00	45.00
CALCIUM	PPM	54.00	64.00	72.00	78.00	66.00
MAGNESIUM	PPM	27.00	26.00	32.00	36.00	49.00
SULFATE	PPM	145	157	185	193	237
CHLORIDE	PPM	7.00	9.00	10.00	8.00	8.00
CARBONATE	PPM	24.00	10.00	24.00	12.00	0.00
BICARBONATE	PPM	148	188	183	232	268
FLOURIDE	PPM	0.30	0.30	0.30	0.30	0.40
SILICON DIO	PPM	5.00	6.00	4.00	4.00	3.00
TOTAL P	PPM	0.02	0.03	0.01	0.09	0.10
NITRATE	PPM	1.00	1.00	2.00	1.00	1.00
POTASSIUM	EPM	0.13	0.10	0.13	0.10	0.08
SODIUM	EPM	1.39	1.31	1.74	1.87	1.96
CALCIUM	EPM	2.69	3.19	3.59	3.89	3.29
MAGNESIUM	EPM	2.22	2.14	2.63	2[illegible]96	4.03
SULFATE	EPM	3.02	3.27	3.85	4.02	4.93
CHLORIDE	EPM	0.20	0.25	0.28	0.23	0.23
CARBONATE	EPM	0.80	0.33	0.80	0.40	0.00
BICARBONATE	EPM	2.43	3.08	3.00	3.80	4.39
FLOURIDE	EPM	0.02	0.02	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		6.44	6.74	8.09	8.83	9.36
TOTAL ANIONS		6.41	6.89	7.88	8.40	9.52
DEVIATION		99.55	102	97.31	95.22	102
TDS (calc.)		367	393	458	488	540
TDS @180		384	401	470	507	619
TOTAL HARDNESS		244	268	313	342	367
ALKALINITY		161	170	190	210	220
NON-CARB HARD		83.00	98.00	123	132	147
LAB CONDUCTIVITY		470	600	660	700	900
FIELD COND.						
LAB pH		9.60	8.90	8.00	8.30	8.20
FIELD pH		8.50	7.20	7.10	7.50	7.10

EPA-287 (Cin.)
(4-76)

TONGUE RIVER #2 4 of 7

DATE		012077	022277	040477	050277	052677
POTASSIUM	PPM	4.00	4.00	4.00	4.00	3.00
SODIUM	PPM	40.00	43.00	35.00	39.00	12.00
CALCIUM	PPM	74.00	80.00	66.00	73.00	42.00
MAGNESIUM	PPM	50.00	40.00	43.00	38.00	11.00
SULFATE	PPM	198	208	200	200	60.00
CHLORIDE	PPM	8.00	7.00	5.00	6.00	5.00
CARBONATE	PPM	0.00	12.00	24.00	10.00	0.00
BICARBONATE	PPM	305	256	220	234	134
FLOURIDE	PPM	0.30	0.30	0.27	0.26	0.15
SILICON DIO	PPM	5.00	2.00	4.00	4.00	8.00
TOTAL P	PPM	0.09	0.08	0.02	0.02	0.02
NITRATE	PPM	1.00	1.00	0.90	0.09	0.55
POTASSIUM	EPM	0.10	0.10	0.10	0.10	0.08
SODIUM	EPM	1.74	1.87	1.52	1.70	0.52
CALCIUM	EPM	3.69	3.99	3.29	3.64	2.10
MAGNESIUM	EPM	4.11	3.29	3.54	3.13	0.90
SULFATE	EPM	4.12	4.33	4.16	4.16	1.25
CHLORIDE	EPM	0.23	0.20	0.14	0.17	0.14
CARBONATE	EPM	0.00	0.40	0.80	0.33	0.00
BICARBONATE	EPM	5.00	4.20	3.61	3.84	2.20
FLOURIDE	EPM	0.02	0.02	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		9.65	9.26	8.46	8.57	3.60
TOTAL ANIONS		9.31	9.09	8.69	8.47	3.56
DEVIATION		96.45	98.21	103	98.88	98.84
TDS (calc.)		524	520	485	485	199
TDS @180		583	517	505	422	204
TOTAL HARDNESS		392	362	343	336	152
ALKALINITY		250	230	220	208	110
NON-CARB HARD		142	132	123	128	42.00
LAB CONDUCTIVITY		900	800	890	751	326
FIELD COND.						
LAB pH		8.00	8.40	8.40	8.40	8.20
FIELD pH		8.00		8.30	8.10	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

TONGUE RIVER #2 5 of 7

DATE		062077	072577	082377	101177	032979
POTASSIUM	PPM	2.00	3.00	4.00	13.00	16.00
SODIUM	PPM	18.00	20.00	30.00	45.00	192
CALCIUM	PPM	43.00	45.00	53.00	54.00	85.00
MAGNESIUM	PPM	15.00	22.00	27.00	47.00	108
SULFATE	PPM	74.00	99.00	151	230	561
CHLORIDE	PPM	6.00	4.00	7.00	6.00	12.00
CARBONATE	PPM	0.00	3.00	3.00	6.00	0.00
BICARBONATE	PPM	144	168	186	238	610
FLOURIDE	PPM	0.18	0.21	0.23	0.28	
SILICON DIO	PPM	4.00	4.00	5.00	5.00	
TOTAL P	PPM	0.01	0.04	0.02	0.07	0.08
NITRATE	PPM	0.30	0.10	0.10	0.10	0.12
POTASSIUM	EPM	0.05	0.08	0.10	0.33	0.41
SODIUM	EPM	0.78	0.87	1.31	1.96	8.35
CALCIUM	EPM	2.15	2.25	2.64	2.69	4.24
MAGNESIUM	EPM	1.23	1.81	2.22	3.87	8.88
SULFATE	EPM	1.54	2.06	3.14	4.79	11.68
CHLORIDE	EPM	0.17	0.11	0.20	0.17	0.34
CARBONATE	EPM	0.00	0.10	0.10	0.20	0.00
BICARBONATE	EPM	2.36	2.75	3.05	3.90	10.00
FLOURIDE	EPM	0.01	0.01	0.01	0.01	
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		4.21	5.00	6.27	8.85	21.89
TOTAL ANIONS		4.04	5.01	6.45	9.03	74.52
DEVIATION		95.77	100	103	102	340
TDS (calc.)		229	279	367	518	1270
TDS @180		263	308	377	541	1220
TOTAL HARDNESS		171	205	244	327	656
ALKALINITY		118	143	158	205	500
NON-CARB HARD		53.00	62.00	86.00	122	156
LAB CONDUCTIVITY		417	480	595	794	1650
FIELD COND.				520	550	
LAB pH		8.20	8.30	8.60	8.50	8.00
FIELD pH			8.10	8.40		

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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
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DATE		043079	082979	092478
POTASSIUM	PPM	6.00	4.00	5.20
SODIUM	PPM	65.00	30.00	47.20
CALCIUM	PPM	83.00	53.00	59.00
MAGNESIUM	PPM	58.00	34.00	41.00
SULFATE	PPM	351	183	219
CHLORIDE	PPM	9.00	2.00	3.80
CARBONATE	PPM	0.00	0.00	15.00
BICARBONATE	PPM	268	207	226
FLOURIDE	PPM			0.30
SILICON DIO	PPM			
TOTAL P	PPM	0.05	0.02	0.02
NITRATE	PPM	0.10	0.10	0.03
POTASSIUM	EPM	0.15	0.10	0.13
SODIUM	EPM	2.83	1.31	2.05
CALCIUM	EPM	4.14	2.64	2.94
MAGNESIUM	EPM	4.77	2.80	3.37
SULFATE	EPM	7.31	3.81	4.56
CHLORIDE	EPM	0.25	0.06	0.11
CARBONATE	EPM	0.00	0.00	0.50
BICARBONATE	EPM	4.39	3.39	3.70
FLOURIDE	EPM			0.02
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		11.89	6.85	8.50
TOTAL ANIONS		64.48	59.83	8.85
DEVIATION		542	874	104
TDS (calc.)		704	408	
TDS @180		709	437	
TOTAL HARDNESS		447	275	316
ALKALINITY		220	170	235
NON-CARB HARD		227	105	
LAB CONDUCTIVITY		1000	640	
FIELD COND.				700
LAB pH		8.10	8.20	8.70
FIELD pH				8.20

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EPA-287 (Cin.)
(4-76)

TONGUE RIVER #2 7 of 7

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	4.69	8.72	28.00
SODIUM	PPM	42.79	1008	28.00
CALCIUM	PPM	62.75	235	28.00
MAGNESIUM	PPM	38.50	364	28.00
SULFATE	PPM	195	10141	28.00
CHLORIDE	PPM	8.24	129	28.00
CARBONATE	PPM	8.43	84.24	28.00
BICARBONATE	PPM	240	9343	28.00
FLOURIDE	PPM	0.29	0.01	25.00
SILICON DIO	PPM	5.37	13.40	24.00
TOTAL P	PPM	0.03	0.00	28.00
NITRATE	PPM	0.08	0.68	28.00
POTASSIUM	EPM	0.12		
SODIUM	EPM	1.86		
CALCIUM	EPM	3.13		
MAGNESIUM	EPM	3.17		
SULFATE	EPM	4.06		
CHLORIDE	EPM	0.23		
CARBONATE	EPM	0.28		
BICARBONATE	EPM	3.94		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		8.28	12.51	28.00
TOTAL ANIONS		14.10	336	28.00
DEVIATION		154	27629	28.00
TDS (calc.)		472	45173	27.00
TDS @180		489	42611	27.00
TOTAL HARDNESS		315	12236	28.00
ALKALINITY		206	5819	28.00
NON-CARB HARD		109	1895	27.00
LAB CONDUCTIVITY		725	73690	27.00
FIELD COND.		590	6200	3.00
LAB pH		8.41	0.18	28.00
FIELD pH		7.70	0.56	20.00

2''
9-1/8''
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

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EPA-287 (Cin.)
(4-70)

ROSEBUD CREEK #1 AT NORTHERN RESERVATION LINE -- WATER YEAR 1979

STATION DESCRIPTION

The station equipment consists of gaging house, servo-manometer bubble gage, and Leopold Stevens A-71 recorder, outside cantilever staff gage and foot bridge. The station is located in SE 1/4 SW 1/4, Section 8, T. 2 S., R. 41 E., on right bank on the Northern Cheyenne Reservation, just south of the Reservation line.

PERIOD OF OPERATION

May 31, 1976 to current year.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 11.8 cfs, September 12,1977.
Maximum daily discharge, 787 cfs, May 21,1978.

STAGE DISCHARGE CURVE

The stage discharge relationship changed substantially during the winter of 1978-1979. The reason for the change is as yet unknown. For the period before freeze up, the stage discharge curve used in water year 1978 was used to compute flows. That relationship is:

$\log(Q) = \log(\text{stage})*1.5043 + 2.10413.$

The stage discharge relationship used during the period March to October, was developed from nine discharge measurements taken during the year.

The stage discharge curve used is concave downward and was approximated by two linear sections. For flows less than 100cfs the following relationship defined by four measurements was used:

$\log(Q) = \log(\text{stage})*2.11296 + 1.69148 \qquad r=.991$

For flows greater than 100 cfs the following relationship defined by five measurements was used:

$\log(Q) = \log(\text{stage})*2.36702 + 1.29292 \qquad r=0.996$

MALFUNCTIONS AND MISSING RECORDS

The manometer frequently malfunctioned during the period November 9 to

February 5,1979.

The recorder didn't operate from April 26 to May 8 after the shelter was struck by a truck.

INTERPRETATION NOTES

Ice cover persisted from November 7 to March 31. Discharge during the winter was gradually decreasing until March 7. Daily discharges were computed by linear interpolation from three discharge measurements taken during this period. No mid winter thaws occured.

From March 7 until March 31, water was flowing over the ice. One discharge measurement was taken during this period. Daily discharges during this period were computed by assuming that the slope of the stage discharge curve was the same as during open water flow, but adjusted downward on the basis of the one discharge measurement. Computed discharges during this period are poor.

During the period April 26 to May 7 discharges were computed by linear interpolation. No significant precipitation occured during this period, and the stage at Rosebud Creek #2 was gradually falling during this period.

DATUM

The gaging station datum is the top of the casing of well NCRP 15B.

ROSEBUD CREEK #1 AT NORTHERN RESERVATION LINE

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	49	53	47	42	37	31	121	198	129	70	45	30
2	49	53	47	42	37	31	119	194	135	68	44	29
3	49	53	47	41	36	31	118	190	133	65	43	28
4	50	53	47	41	36	31	117	186	125	63	42	28
5	50	53	46	41	36	31	115	181	117	62	41	27
6	50	53	46	41	36	30	116	177	110	62	39	26
7	50	53	46	41	36	35	119	173	109	61	37	26
8	50	53	46	41	36	38	127	178	105	59	37	26
9	50	53	45	41	36	43	133	176	104	57	37	26
10	50	52	45	40	35	49	146	176	104	55	36	26
11	50	52	45	40	35	47	167	175	104	53	35	25
12	50	52	45	40	35	54	184	173	103	52	35	25
13	50	52	45	40	35	90	193	168	100	50	34	26
14	50	51	45	40	35	86	190	166	96	48	34	27
15	50	51	45	40	34	85	174	164	92	48	34	27
16	50	51	44	39	34	75	173	161	88	47	34	29
17	50	51	44	39	34	75	181	159	86	47	34	29
18	51	50	44	39	34	75	210	156	83	46	34	28
19	51	50	44	39	33	75	238	152	82	46	34	27
20	51	50	44	39	33	75	258	150	82	45	34	27
21	51	50	44	39	33	70	272	140	82	43	32	27
22	53	49	43	38	33	75	275	135	80	42	32	27
23	53	49	43	38	33	75	260	131	78	42	32	27
24	53	49	43	38	32	85	237	128	78	43	32	26
25	53	49	43	38	32	80	224	125	75	44	32	26
26	53	49	43	38	32	85	220	122	72	49	31	27
27	53	48	43	38	32	85	215	118	70	48	31	27
28	53	48	42	37	32	85	211	228	84	46	31	27
29	53	48	42	37		90	207	110	75	45	30	27
30	53	48	42	37		95	203	117	70	45	30	28
31	53		42	37		95		122			30	
MEAN	51	51	44	39	34	65	184	159	95	52	35	27
MAX	53	53	47	42	37	95	275	228	135	70	45	30
MIN	49	48	42	37	32	30	115	110	70	42	30	25

MEAN FOR YEAR IS: 70

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 AT NORTHERN RESERVATION --WATER YEAR 1978

STATION DESCRIPTION

Gaging house, servo-manometer bubble gage, and Leopold Stevens A-71 recorder, outside cantilever staff gage, and foot bridge. The station is located in SE 1/4 SW 1/4, Section 8, T.2 S., R. 41 E., on the right bank on the Northern Cheyenne Reservation, just south of the Reservation line.

PERIOD OF OPERATION

June 1976 to current year.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 11.8 cfs, September 12,1977.
Maximum daily discharge, 787 cfs, May 21,1978.
Maximum instantaneous discharge , 885 cfs, May 21,1978.

STAGE DISCHARGE CURVE

The stage discharge relation used was developed from 11 discharge measurements taken in water year 1977, and five discharge measurements taken in water year 1978. The relationship is reasonably well defined at flows between 15 and 800 cfs.

MALFUNCTIONS AND MISSING RECORDS

The manometer and recorder operated satifactorily for the entire year, except for the short period of October 4 to 10 when the recorder was not engaged.

A new staff gage was installed in April as it was noted that the previous cantilever gage was warping. Datum for both gages is the same.

INTERPRETATION NOTES

A solid ice cover existed from the end of November until March 20. During the winter two discharge measurements were taken, and the same discharge was gaged on each measurement. Therefore, it was assumed that daily flows were constant until water began flowing over the ice on March 8. Linear interpolation was used to compute daily discharges during the period of ice out, March 8 to March 20.

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 NORTHERN RESERVATION LINE

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	18	19	19	19	19	70	49	393	98	51	37
2	18	19	19	19	19	19	86	55	391	100	51	36
3	17	20	19	19	19	19	83	59	393	92	52	35
4	18	20	19	19	19	19	77	57	386	87	52	35
5	18	20	19	19	19	19	66	56	391	82	52	34
6	19	21	19	19	19	19	64	58	368	81	51	34
7	19	19	19	19	19	19	60	65	330	81	50	34
8	20	19	19	19	19	23	55	77	303	84	50	35
9	20	19	19	19	19	26	52	84	281	79	48	35
10	21	19	19	19	19	28	49	105	259	75	48	35
11	21	19	19	19	19	31	48	127	244	73	47	38
12	22	19	19	19	19	34	46	155	218	73	46	42
13		19	19	19	19	37	44	199	206	72	45	47
14	21	19	19	19	19	40	43	194	194	68	47	56
15	21	19	19	19	19	42	43	144	184	64	48	63
16	20	19	19	19	19	45	42	133	177	62	50	62
17	20	19	19	19	19	48	42	141	169	61	51	56
18	19	19	19	19	19	51	43	208	165	61	51	55
19	19	19	19	19	19	54	44	423	162	60	50	55
20	19	19	19	19	19	56	46	668	157	60	50	55
21	19	19	19	19	19	59	46	787	143	60	49	58
22	19	19	19	19	19	62	46	668	135	60	49	57
23	19	19	19	19	19	59	45	637	131	60	48	56
24	18	19	19	19	19	58	43	600	137	59	47	54
25	18	19	19	19	19	59	42	574	134	57	45	53
26	18	19	19	19	19	62	41	550	123	55	44	51
27	18	19	19	19	19	71	41	519	118	54	43	48
28	18	19	19	19	19	69	39	491	117	52	41	49
29	18	19	19	19		67	39	446	112	51	40	49
30	18	19	19	19		63	43	411	104	51	39	48
31	18		19	19		64		393		51	38	
MEAN	19	19	19	19	19	43	51	295	221	69	47	47
MAX	22	21	19	19	19	71	86	787	393	100	52	63
MIN	17	18	19	19	19	19	39	49	104	51	38	34

MEAN FOR YEAR IS: 72

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
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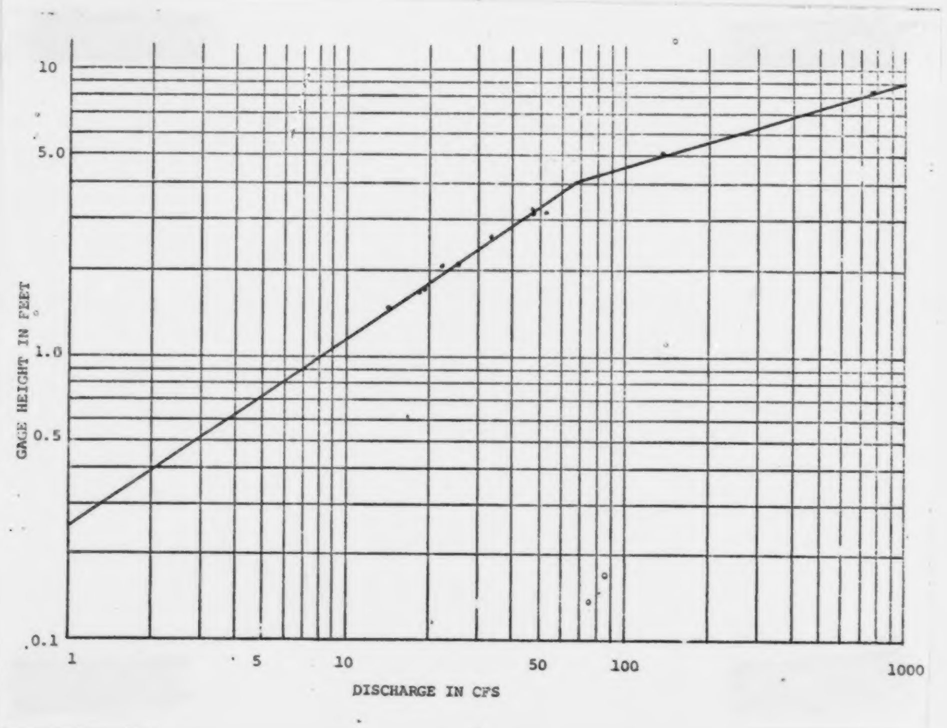
ROSEBUD CREEK #1--WATER YEAR 1977

The outside staff gage was initially installed in April 1976, and monthly current meter measurements began in June, 1976. The servo manometer bubble gage began recording daily gage heights on May 31, 1977. A fairly continuous daily record is available from that date to the present except for winter months when the manometer frequently malfunctioned.

The stage-discharge curve for water year 1977 was defined by 11 measurements taken during the year. The manometer was set initially to the outside gage reading which was the primary reference gage. The manometer and outside gage remained in close agreement throughout the 1977 water year. The rating curve was obtained by eye-fit to the 11 measurements and is shown in the accompanying diagram.



Stage discharge curve for RBC #1, water year 1977-78

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3/8"

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 AT NORTHERN RESERVATION LINE

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									55	38	28	14
2									54	38	25	14
3									53	38	24	13
4								60	51	37	24	13
5									51	37	24	13
6									48	37	24	13
7										37	24	13
8										38	24	12
9								67	52	37	24	12
10										37	22	13
11										36	21	12
12								67		35	19	12
13							41			35	17	12
14										33	16	12
15					26					32	14	13
16										32	14	13
17									54	30	14	13
18				24					60	30	15	13
19		25							53	28	15	13
20									50	28	14	12
21									50	26	14	13
22			24						50	26	13	14
23									48	26	13	14
24								65	47	26	13	14
25								62	45	25	13	15
26							136		44	26	13	15
27								58	42	27	14	16
28									41	27	14	15
29	22								41	28	13	15
30									40	28	13	16
31						47		56		28	14	
MEAN	22	25	24	24	26	47	88	62	49	32	18	13
MAX	22	25	24	24	26	47	136	67	60	38	28	16
MIN	22	25	24	24	26	47	41	56	40	25	13	12

MEAN FOR YEAR IS: 36

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
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ROSEBUD CREEK #1 AT THE NORTHERN RESERVATION LINE 1

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 18	OCT 25	DEC 12	FEB 7	MAR 14	APR 4	APR 10	APR 20
DISCHARGE......	49	53	45	36	86	120	127	248
GAGE HEIGHT....	3.22	3.30	3.53	3.78	5.27	4.30	4.56	5.90
ADJ. GAGE HT...	2.92	3.00	3.53	3.86	5.27	4.30	4.56	5.90
WIDTH..........	17	25	22	22	30	21	24	26
AREA...........	50	58	50	34	42	78	89	129
MEAN DEPTH.....	2.96	2.05		1.54	1.41	3.69	3.70	4.95
MEAN VELOCITY..	0.96	0.92	0.90	1.07	2.03	1.55	1.44	1.93
# OF SECTIONS..	17	25	23	22	7.00	21	7.00	7.00
CHANGE IN G.HT.					0.10		0.01	
TIME...........	1.00	1.00		3.15	2.00	2.10	2.00	2.00
TEMPERATURE....	6.80	5.90	0.20		0.60	3.80	7.50	
METER TYPE.....	AA	AA	PYG	PYG	AA	AA	AA	AA
FREE OR ICE....			ICE	ICE	MIX			
SUSPENSION.....	ROD	CAB	ROD	ROD	ROD	CAB	CAB	CAB
GAGED BY.......	JWM	TJO	TJO	JWM	JWM	CBA	JWM	JWM

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 AT THE NORTHERN RESERVATION LINE

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	MAY 8	JUN 6	JUL 17	AUG 22	SEP 18
DISCHARGE......	174	105	51	31	26
GAGE HEIGHT....	5.18	4.14	2.74	2.30	2.18
ADJ. GAGE HT...	5.18	4.14	2.74	2.30	2.18
WIDTH..........	29	21	19	17	18
AREA...........	111	74	46	36	34
MEAN DEPTH.....	3.76	3.48	2.37	2.09	1.85
MEAN VELOCITY..	1.58	1.41	1.09	0.93	0.80
# OF SECTIONS..	27	21	18	4.00	16
CHANGE IN G.HT.	0.01	0.01			
TIME...........	2.00	2.00	2.00	2.00	1.00
TEMPERATURE....	10		22	19	15
METER TYPE.....	AA	AA	AA	AA	AA
FREE OR ICE....					
SUSPENSION.....	CAB	CAB	ROD	ROD	ROD
GAGED BY.......	TJO	JWM	JWM	JWM	JWM

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1

WATER YEAR 1978

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 31	JAN 26	MAY 21
DISCHARGE......	19	19	790
GAGE HEIGHT....	1.74	2.44	8.66
ADJ. GAGE HT...			
WIDTH..........	16	17	
AREA...........	20	20	283
MEAN DEPTH.....	1.23	1.17	
MEAN VELOCITY..	0.94	0.98	2.80
# OF SECTIONS..	29	16	14
CHANGE IN G.HT.	0.01		
TIME...........	0.90		
TEMPERATURE....	7.30	0.01	
METER TYPE.....	AA	PYG	AA
FREE OR ICE....		ICE	
SUSPENSION.....	ROD	ROD	CAB
GAGED BY.......	TJO	TJO	TJO

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

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TOP OF IMAGE AREA
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ROSEBUD CREEK #1

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 29	NOV 19	DEC 22	JAN 18	FEB 15	MAR 31	APR 26	MAY 9
DISCHARGE......	22	25	24	24	26	47	136	67
GAGE HEIGHT....	2.08	2.14	2.08	2.48	2.50	3.19		4.06
ADJ. GAGE HT...								
WIDTH..........	21	21	21	20	20	19	24	18
AREA...........	40	43	34	36	34	49	98	56
MEAN DEPTH.....	1.92	2.03	1.60	1.76	1.72	2.58	4.08	3.09
MEAN VELOCITY..	0.55	0.59	0.72	0.66	0.75	0.95	1.39	1.21
# OF SECTIONS..	21	21	18	19	20	19	15	17
CHANGE IN G.HT.								
TIME...........								
TEMPERATURE....			0.10	0.10	0.10			
METER TYPE.....	AA	AA	PYG	PYG	PYG	AA	AA	AA
FREE OR ICE....			ICE	ICE	ICE			
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	TJO	TJO	TJO	TJO	TJO

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 9	JUL 11	AUG 16	SEP 27
DISCHARGE......	52	33	14	19
GAGE HEIGHT....	3.20	2.70	1.50	1.68
ADJ. GAGE HT...				
WIDTH..........	19	19	15	16
AREA...........	36	36	16	18
MEAN DEPTH.....	1.85	1.90	1.01	1.16
MEAN VELOCITY..	1.45	0.91	0.90	1.02
# OF SECTIONS..	35	32	24	27
CHANGE IN G.HT.				0.01
TIME...........				1.00
TEMPERATURE....				9.00
METER TYPE.....	AA	AA	AA	AA
FREE OR ICE....				
SUSPENSION.....	ROD	ROD	ROD	ROD
GAGED BY.......	WSE	WSE	TJO	TJO

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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ROSEBUD CREEK #1

WATER YEAR 1976

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 16	JUL 21	AUG 16	SEP 14
DISCHARGE......	63	34	20	16
GAGE HEIGHT....	3.07	2.38	1.85	1.75
ADJ. GAGE HT...				
WIDTH..........	22	22	21	21
AREA...........	66	50	38	34
MEAN DEPTH.....	2.91	2.26	1.81	1.62
MEAN VELOCITY..	0.97	0.68	0.54	0.47
# OF SECTIONS..	20	22	21	30
CHANGE IN G.HT.				
TIME...........				
TEMPERATURE....	15		19	
METER TYPE.....	AA	AA	AA	AA
FREE OR ICE....				
SUSPENSION.....	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	TJO

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

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ROSEBUD CREEK #1 1 of 7

DATE		121975	012976	030476	033076	050476
POTASSIUM	PPM	9.00	10.00	7.00	8.00	10.00
SODIUM	PPM	55.00	69.00	60.00	52.00	44.00
CALCIUM	PPM	82.00	86.00	84.00	82.00	82.00
MAGNESIUM	PPM	90.00	90.00	90.00	77.00	75.00
SULFATE	PPM	242	277	248	274	212
CHLORIDE	PPM	3.00	3.00	6.00	6.00	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	586	567	537	451	488
FLOURIDE	PPM	0.60	0.60	0.60	0.60	0.60
SILICON DIO	PPM	15.00	13.00	15.00	15.00	10.00
TOTAL P	PPM	0.05	0.20	0.06	0.10	0.10
NITRATE	PPM	1.20	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.23	0.26	0.18	0.20	0.26
SODIUM	EPM	2.39	3.00	2.61	2.26	1.91
CALCIUM	EPM	4.09	4.29	4.19	4.09	4.09
MAGNESIUM	EPM	7.40	7.40	7.40	6.33	6.17
SULFATE	EPM	5.04	5.77	5.16	5.70	4.41
CHLORIDE	EPM	0.08	0.08	0.17	0.17	0.17
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.60	9.29	8.80	7.39	8.00
FLOURIDE	EPM	0.03	0.03	0.03	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.12	14.95	14.38	12.89	12.43
TOTAL ANIONS		14.74	15.16	14.12	13.25	12.57
DEVIATION		104	101	98.18	103	101
TDS (calc.)		769	814	767	721	669
TDS @180		824	840	804	859	705
TOTAL HARDNESS		575	585	578	521	514
ALKALINITY		480	465	440	370	400
NON-CARB HARD		95.00	120	138	151	114
LAB CONDUCTIVITY		1020	1200	1000	1100	1100
FIELD COND.						
LAB pH		8.30	8.00	7.90	7.90	7.10
FIELD pH		6.80	6.80	6.90	5.10	7.30

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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ROSEBUD CREEK #1 2 of 7

DATE		052676	070876	072876	080676	090176
POTASSIUM	PPM	10.00	9.00	10.00	15.00	15.00
SODIUM	PPM	55.00	50.00	59.00	67.00	79.00
CALCIUM	PPM	74.00	99.00	60.00	74.00	78.00
MAGNESIUM	PPM	85.00	55.00	81.00	75.00	84.00
SULFATE	PPM	240	200	230	271	330
CHLORIDE	PPM	5.00	6.00	8.00	10.00	14.00
CARBONATE	PPM	0.00	30.00	0.00	36.00	36.00
BICARBONATE	PPM	500	427	451	360	409
FLOURIDE	PPM	0.60	0.20	0.60	0.50	0.70
SILICON DIO	PPM	11.00	13.00	13.00	12.00	12.00
TOTAL P	PPM	0.10	0.04	0.01	0.02	0.05
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.26	0.23	0.26	0.38	0.38
SODIUM	EPM	2.39	2.18	2.57	2.91	3.44
CALCIUM	EPM	3.69	4.94	2.99	3.69	3.89
MAGNESIUM	EPM	6.99	4.52	6.66	6.17	6.91
SULFATE	EPM	5.00	4.16	4.79	5.64	6.87
CHLORIDE	EPM	0.14	0.17	0.23	0.28	0.39
CARBONATE	EPM	0.00	1.00	0.00	1.20	1.20
BICARBONATE	EPM	8.19	7.00	7.39	5.90	6.70
FLOURIDE	EPM	0.03	0.01	0.03	0.03	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.33	11.87	12.48	13.16	14.62
TOTAL ANIONS		13.33	12.30	12.38	12.98	15.10
DEVIATION		99.97	104	99.19	98.61	103
TDS (calc.)		715	659	670	725	837
TDS @180		736	675	703	752	843
TOTAL HARDNESS		534	473	482	492	537
ALKALINITY		410	400	370	355	395
NON-CARB HARD		124	73.00	112	137	142
LAB CONDUCTIVITY		1000	1000	1000	1200	1100
FIELD COND.						
LAB pH		7.60	8.20	7.90	9.50	9.30
FIELD pH		7.70	8.10	7.40	7.50	7.80

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PAGE NUMBER
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(4-76)

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

ROSEBUD CREEK #1 3 of 7

DATE		092376	102176	111776	121376	011877
POTASSIUM	PPM	15.00	12.00	9.00	10.00	8.00
SODIUM	PPM	70.00	67.00	68.00	65.00	65.00
CALCIUM	PPM	160	154	226	190	84.00
MAGNESIUM	PPM	38.00	44.00	4.00	31.00	80.00
SULFATE	PPM	278	264	289	276	253
CHLORIDE	PPM	12.00	15.00	10.00	13.00	10.00
CARBONATE	PPM	72.00	84.00	60.00	60.00	0.00
BICARBONATE	PPM	366	354	427	427	537
FLOURIDE	PPM	0.60	0.50	0.60	0.50	0.70
SILICON DIO	PPM	15.00	18.00	17.00	17.00	21.00
TOTAL P	PPM	0.04	0.02	0.11	0.06	0.13
NITRATE	PPM	3.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.38	0.31	0.23	0.26	0.20
SODIUM	EPM	3.05	2.91	2.96	2.83	2.83
CALCIUM	EPM	7.98	7.68	11.28	9.48	4.19
MAGNESIUM	EPM	3.13	3.62	0.33	2.55	6.58
SULFATE	EPM	5.79	5.50	6.02	5.75	5.27
CHLORIDE	EPM	0.34	0.42	0.28	0.37	0.28
CARBONATE	EPM	2.40	2.80	2.00	2.00	0.00
BICARBONATE	EPM	6.00	5.80	7.00	7.00	8.80
FLOURIDE	EPM	0.03	0.03	0.03	0.03	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.54	14.53	14.79	15.11	13.80
TOTAL ANIONS		14.47	14.44	15.26	15.04	14.32
DEVIATION		99.52	99.39	103	99.53	104
TDS (calc.)		825	814	876	855	764
TDS @180		883	780	875	875	821
TOTAL HARDNESS		557	567	578	602	540
ALKALINITY		420	430	450	450	440
NON-CARB HARD		137	137	128	152	100.00
LAB CONDUCTIVITY		850	1200	1240	1140	1230
FIELD COND.						
LAB pH		8.20	8.20	8.30	8.30	8.10
FIELD pH		7.30	8.10	7.90		7.50

ROSEBUD CREEK #1 4 of 7

DATE		021777	032177	042577	052477	061577
POTASSIUM	PPM	9.00	10.00	6.00	7.00	7.00
SODIUM	PPM	65.00	50.00	30.00	40.00	37.00
CALCIUM	PPM	134	111	67.00	85.00	61.00
MAGNESIUM	PPM	53.00	63.00	56.00	65.00	65.00
SULFATE	PPM	250	267	163	188	142
CHLORIDE	PPM	14.00	6.00	6.00	11.00	6.00
CARBONATE	PPM	0.00	36.00	12.00	48.00	30.00
BICARBONATE	PPM	488	415	342	354	360
FLOURIDE	PPM	0.60	0.60	0.45	0.51	0.52
SILICON DIO	PPM	18.00	14.00	12.00	16.00	17.00
TOTAL P	PPM	0.13	0.02	0.19	0.03	0.10
NITRATE	PPM	1.00	0.20	0.70	0.70	1.10
POTASSIUM	EPM	0.23	0.26	0.15	0.18	0.18
SODIUM	EPM	2.83	2.18	1.31	1.74	1.61
CALCIUM	EPM	6.69	5.54	3.34	4.24	3.04
MAGNESIUM	EPM	4.36	5.18	4.61	5.35	5.35
SULFATE	EPM	5.20	5.56	3.39	3.91	2.96
CHLORIDE	EPM	0.39	0.17	0.17	0.31	0.17
CARBONATE	EPM	0.00	1.20	0.40	1.60	1.00
BICARBONATE	EPM	8.00	6.80	5.61	5.80	5.90
FLOURIDE	EPM	0.03	0.03	0.02	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.10	13.15	9.41	11.51	10.18
TOTAL ANIONS		13.53	13.72	9.55	11.57	10.01
DEVIATION		95.92	104	102	101	98.34
TDS (calc.)		765	747	508	618	525
TDS @180		823	779	552	652	594
TOTAL HARDNESS		551	537	398	478	419
ALKALINITY		400	400	300	370	345
NON-CARB HARD		151	137	98.00	108	74.00
LAB CONDUCTIVITY		1140	1220	846	1019	912
FIELD COND.						
LAB pH		8.20	8.30	8.30	8.50	8.30
FIELD pH			8.10	8.40		

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 5 of 7

DATE		072877	082977	100677	102777	020679
POTASSIUM	PPM	10.00	13.00	14.00	10.00	11.00
SODIUM	PPM	70.00	80.00	80.00	70.00	69.00
CALCIUM	PPM	61.00	84.00	74.00	68.00	109
MAGNESIUM	PPM	76.00	68.00	78.00	93.00	90.00
SULFATE	PPM	244	275	254	262	326
CHLORIDE	PPM	8.00	12.00	10.00	10.00	13.00
CARBONATE	PPM	30.00	36.00	36.00	24.00	0.00
BICARBONATE	PPM	366	366	451	476	586
FLOURIDE	PPM	0.48	0.56	0.52	0.62	
SILICON DIO	PPM	17.00	12.00	15.00	16.00	
TOTAL P	PPM	0.11	0.04	0.53	0.01	0.21
NITRATE	PPM	0.10	0.10	0.10	0.80	0.46
POTASSIUM	EPM	0.26	0.33	0.36	0.26	0.28
SODIUM	EPM	3.05	3.48	3.48	3.05	3.00
CALCIUM	EPM	3.04	4.19	3.69	3.39	5.44
MAGNESIUM	EPM	6.25	5.59	6.42	7.65	7.40
SULFATE	EPM	5.08	5.73	5.29	5.45	6.79
CHLORIDE	EPM	0.23	0.34	0.28	0.28	0.37
CARBONATE	EPM	1.00	1.20	1.20	0.80	0.00
BICARBONATE	EPM	6.00	6.00	7.39	7.80	9.60
FLOURIDE	EPM	0.03	0.03	0.03	0.03	
NITRATE	EPM	0.00	0.00	0.01	0.00	0.00
TOTAL CATIONS		12.60	13.60	13.95	14.34	16.13
TOTAL ANIONS		12.27	13.20	14.12	14.30	69.25
DEVIATION		97.43	97.11	101	99.67	429
TDS (calc.)		679	748	768	771	906
TDS @180		677	563	798	782	940
TOTAL HARDNESS		463	486	505	553	643
ALKALINITY		350	360	430	430	480
NON-CARB HARD		113	126	75.00	123	163
LAB CONDUCTIVITY		1049	1094	1156	1176	1230
FIELD COND.				770	780	
LAB pH		8.50	8.30	8.50	8.30	7.70
FIELD pH		8.50	8.49	8.26		

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
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ROSEBUD CREEK #1 6 of 7

DATE		031379	040479	040479	091879	091879
POTASSIUM	PPM	14.00	11.00	11.00	12.00	12.00
SODIUM	PPM	56.00	64.00	64.00	74.00	74.00
CALCIUM	PPM	79.00	93.00	93.00	79.00	79.00
MAGNESIUM	PPM	71.00	91.00	91.00	89.00	89.00
SULFATE	PPM	241	342	355	316	316
CHLORIDE	PPM	14.00	7.00	9.00	10.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	451	488	500	476	476
FLOURIDE	PPM					
SILICON DIO	PPM					
TOTAL P	PPM	0.12	0.07	0.05	0.01	0.01
NITRATE	PPM	0.48	0.22	0.22	0.10	0.10
POTASSIUM	EPM	0.36	0.28	0.28	0.31	0.31
SODIUM	EPM	2.44	2.78	2.78	3.22	3.22
CALCIUM	EPM	3.94	4.64	4.64	3.94	3.94
MAGNESIUM	EPM	5.84	7.49	7.49	7.32	7.32
SULFATE	EPM	5.02	7.12	7.39	6.58	6.58
CHLORIDE	EPM	0.39	0.20	0.25	0.28	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	7.39	8.00	8.19	7.80	7.80
FLOURIDE	EPM					
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		12.58	15.19	15.19	14.79	14.79
TOTAL ANIONS		65.29	67.85	68.36	67.18	67.18
DEVIATION		519	447	450	454	454
TDS (calc.)		697	848	869	814	814
TDS @180		623	762	790	845	845
TOTAL HARDNESS		490	608	608	564	564
ALKALINITY		370	400	410	390	390
NON-CARB HARD		120	208	198	174	174
LAB CONDUCTIVITY		1000	1160	1200	1200	1200
FIELD COND.		570			1080	1080
LAB pH		7.90	7.80	8.10	8.10	8.10
FIELD pH						

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
9-1/2"
9-1/8"
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #1 7 of 7

DATE		091879	MEAN	ST.DEV	#
POTASSIUM	PPM	12.00	10.52	5.86	31.00
SODIUM	PPM	74.00	62.00	154	31.00
CALCIUM	PPM	79.00	95.84	1439	31.00
MAGNESIUM	PPM	89.00	71.81	427	31.00
SULFATE	PPM	316	263	2371	31.00
CHLORIDE	PPM	10.00	9.13	10.63	31.00
CARBONATE	PPM	0.00	20.32	608	31.00
BICARBONATE	PPM	476	450	4833	31.00
FLOURIDE	PPM		0.56	0.01	24.00
SILICON DIO	PPM		14.75	6.69	24.00
TOTAL P	PPM	0.01	0.07	0.01	31.00
NITRATE	PPM	0.10	0.41	0.73	31.00
POTASSIUM	EPM	0.31	0.27		
SODIUM	EPM	3.22	2.70		
CALCIUM	EPM	3.94	4.78		
MAGNESIUM	EPM	7.32	5.91		
SULFATE	EPM	6.58	5.47		
CHLORIDE	EPM	0.28	0.26		
CARBONATE	EPM	0.00	0.68		
BICARBONATE	EPM	7.80	7.38		
FLOURIDE	EPM		0.03		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		14.79	13.66	2.20	31.00
TOTAL ANIONS		67.18	25.61	513	31.00
DEVIATION		454	181	22526	31.00
TDS (calc.)		814	754	8660	31.00
TDS @180		845	769	9501	31.00
TOTAL HARDNESS		564	534	3044	31.00
ALKALINITY		390	403	1656	31.00
NON-CARB HARD		174	131	1081	31.00
LAB CONDUCTIVITY		1200	1103	12298	31.00
FIELD COND.		1080	893	39522	6.00
LAB pH		8.10	8.19	0.18	31.00
FIELD pH			7.58	0.62	19.00

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK #1

STATION DESCRIPTION

The station consists of a gaging house, stilling well, float gage, Leopold-Stevens A-71 recorder, seven foot Cipolletti weir and outside staff gage. The station is located in NE 1/4 NW 1/4 SE 1/4 Section 8 T. 2 S. R. 41 E.

PERIOD OF RECORD

April 7,1977 to November 22, 1978.

6-1/2"

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 1.40 cfs, August 1977.
Maximum daily discharge, 74 cfs, May 18,1978.
Maximum discharge, 97 cfs, May 18,1978.

STAGE DISCHARGE CURVE

A standard rating curve for a seven foot Cipolletti weir was used as published to convert gage heights to discharge. The recorder was set to agree with the outside gage. The datum used was the crest of the weir lip which corresponded to 3.66 feet on the outside gage as surveyed June 7,1977. The weir rated discharge was checked several times with current meter measurements and found to agree within measurement accuracy.

MALFUNCTIONS

A combination of ice and recorder problems occurred from November 16, 1977 to February 2,1978 which caused the loss of daily stage records. The fill on the south wing wall washed out in March, 1978 and was repaired April 25,1978. It operated properly until November 22,1978. A series of recorder and clock failures occurred from November 23,1978 to February 5,1979. The wing wall fill again washed out in March 1979 and was not repaired. Monthly discharge measurements were taken during the remainder of water year 1979 at a location approximately 150 feet below the washed out weir. A new stage reference point was established for these measurements.

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LAME DEER CREEK #1

WATER YEAR 1978

MEAN DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.27	1.80						7.35	15	7.84	7.35	6.65
2	2.11	1.80						8.84	14	7.84	7.11	6.65
3	1.50	1.80						7.35	13	7.84	7.11	6.88
4	1.50	1.80						7.59	13	7.84	7.11	6.88
5	1.50	1.80						9.35	13	7.84	7.11	6.88
6	1.50	1.95						8.08	12	7.84	7.59	6.65
7	1.65	1.95						8.84	12	7.84	7.11	6.65
8	1.80	1.80						12	12	7.84	6.88	6.65
9	1.65	1.80						10	12	7.84	6.88	6.88
10	1.65	1.80						9.61	11	7.84	6.65	7.35
11	1.50	1.80						8.84	11	8.08	6.65	8.58
12	1.37	1.80						12	11	8.58	6.65	9.09
13	1.37	1.80						11	10	8.33	6.65	8.08
14	1.37	1.80						11	10	8.08	6.65	8.08
15	1.37	1.80						10	9.61	7.59	6.88	7.59
16	1.37	1.80						10	9.61	7.59	6.88	7.59
17	1.50							16	10	7.59	6.88	8.08
18	1.50							38	9.88	7.84	6.65	10
19	1.50							68	9.35	7.84	6.88	9.35
20	1.50							33	9.09	7.84	6.88	8.58
21	1.50							22	9.09	8.08	6.41	8.33
22	1.50							19	9.35	8.08	6.41	8.33
23	1.50							16	8.58	8.08	6.41	8.58
24	1.50							15	8.58	8.08	6.41	8.08
25	1.50						7.11	15	8.58	7.84	6.41	8.08
26	1.50						6.41	14	8.58	7.35	6.41	7.84
27	1.50						6.19	14	8.58	7.11	6.41	7.84
28	1.50						6.41	13	8.58	7.11	6.65	7.84
29	1.50						6.19	13	8.33	7.11	6.65	7.84
30	1.50						6.19	14	8.08	7.35	6.41	7.84
31	1.65							14			6.65	
MEAN	1.55	1.81					6.41	15	10	7.79	6.76	7.79
MAX	2.27	1.95					7.11	68	15	8.58	7.59	10
MIN	1.37	1.80					6.19	7.35	8.08	7.11	6.41	6.65

MEAN FOR YEAR IS: 7.24101

BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LAME DEER CREEK #1

WATER YEAR 1977

MEAN DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								2.60	3.12	1.95	1.50	1.24
2								2.60	2.95	1.95	1.50	1.24
3								2.60	2.95	1.95	1.50	1.37
4								2.60	2.77	1.95	1.50	1.37
5								2.60	2.60	1.95	1.65	1.37
6								2.60	2.60	2.11	1.65	1.37
7							5.74	2.43	2.60	1.95	1.65	1.37
8							5.52	2.43	2.43	1.95	1,65	1.24
9							4.88	2.60	2.60	1.80	1.65	1.24
10							4.47	2.43	2.60	1.95	1.65	1.24
11							3.87	2.43	3.87	1.80	1.80	1.24
12							3.87	2.43	3.12	1.80	1.50	1.24
13							3.68	2.43	2.77	1.80	1.24	1.24
14							3.12	2.43	2.60	1.80	1.24	1.24
15							3.12	4.27	2.60	1.80	1.24	1.12
16							2.95	5.52	2.60	1.65	1.37	1.50
17							2.95	3.31	2.60	1.65	1.37	1.65
18							2.95	4.07	2.60	1.50	1.50	1.65
19							2.77	4.27	2.43	1.50	1.37	1.65
20							2.60	2.77	2.43	1.37	1.24	1.65
21							2.60	2.77	2.27	1.37	1.24	1.65
22							2.60	2.77	2.27	1.37	1.24	1.65
23							2.60	2.60	2.27	1.37	1.24	1.65
24							2.60	2.43	2.43	1.37	1.50	1.50
25							2.43	2.43	2.27	1.50	1.37	1.50
26							2.60	2.43	2.27	2.65	1.24	1.37
27							2.60	2.60	2.11	1.65	1.24	1.37
28							2.60	3.12	2.11	1.50	1.50	1.37
29							2.43	3.12	2.11	1.50	1.24	1.37
30							2.43	3.31	2.11	1.50	1.24	1.37
31								3.31		1.50	1.37	
MEAN							3.24	2.91	2.56	1.69	1.42	1.40
MAX							5.74	5.52	3.87	2.11	1.80	1.65
MIN							2.43	2.43	2.11	1.37	1.24	1.12

MEAN FOR YEAR IS: 2.21

6-1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

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EPA-287 (Cin.)
(4-76)

Lame Deer Creek at Lame Deer

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
05-12-76	5.1	At LDC #1 (weir location)
06-03-76	2.1	At Highway 212 bridge
07-08-76	1.8	At Highway 212 bridge
07-15-76	2.8	50 feet above Lame Deer sewage lagoon outfall
08-20-76	2.2	same
09-09-76	2.2	same
10-29-76	2.5	same
11-24-76	2.6	same
12-16-76	1.4	same
01-18-77	1.3	same
02-12-77	2.2	same
03-14-77	2.5	same
04-06-77	5.8	At LDC #1
05-03-77	2.7	same
11-01-77	1.3	same
12-04-79	2.44	same
12-19-79	3.31	same
01-21-80	3.09	same

LAME DEER CREEK BELOW THE WEIR

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	MAR 7	APR 4	MAY 10	JUN 6	JUL 19	AUG 22	SEP 18
DISCHARGE......	3.26	4.52	5.56	3.81	1.66	2.01	1.96
GAGE HEIGHT....	4.14	4.19	4.32	4.17	4.31	4.44	4.55
ADJ. GAGE HT...							
WIDTH..........	5.10	5.10	4.40	5.45	2.85	5.20	5.80
AREA...........	4.75	3.50	4.02	4.04	3.76	3.30	3.33
MEAN DEPTH.....	0.93	0.69	0.91	0.74	1.32	0.64	0.57
MEAN VELOCITY..	0.69	1.29	1.38	0.94	0.43	0.62	0.61
# OF SECTIONS..	10	8.00	9.00	11	6.00	9.00	9.00
CHANGE IN G.HT.							
TIME...........	0.30	0.30	0.45	0.45	1.00	0.45	1.00
TEMPERATURE....	1.00	0.70		16	19		14
METER TYPE.....	PYG	PYG	PYG	PYG	PYG	PYG	PYG
FREE OR ICE....							
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	CBA	JWM	JWM	JWM	JWM	JWM

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK AT THE WEIR 1 of 7

DATE		121275	012276	030376	032576	050276
POTASSIUM	PPM	10.00	7.00	9.00	10.00	7.00
SODIUM	PPM	69.00	76.00	47.00	70.00	47.00
CALCIUM	PPM	74.00	163	72.00	72.00	68.00
MAGNESIUM	PPM	76.00	26.00	66.00	80.00	63.00
SULFATE	PPM	194	196	127	201	119
CHLORIDE	PPM	12.00	18.00	3.00	4.00	6.00
CARBONATE	PPM	0.00	30.00	0.00	72.00	0.00
BICARBONATE	PPM	567	512	506	721	500
FLOURIDE	PPM	1.10	0.80	0.70	1.10	0.80
SILICON DIO	PPM	17.00	17.00	19.00	10.00	18.00
TOTAL P	PPM	0.22	0.52	0.02	0.20	0.10
NITRATE	PPM	2.50	1.50	1.00	1.00	1.00
POTASSIUM	EPM	0.26	0.18	0.23	0.26	0.18
SODIUM	EPM	3.00	3.31	2.04	3.05	2.04
CALCIUM	EPM	3.69	8.13	3.59	3.59	3.39
MAGNESIUM	EPM	6.25	2.14	5.43	6.58	5.18
SULFATE	EPM	4.04	4.08	2.64	4.18	2.48
CHLORIDE	EPM	0.34	0.51	0.08	0.11	0.17
CARBONATE	EPM	0.00	1.00	0.00	2.40	0.00
BICARBONATE	EPM	9.29	8.39	8.29	11.82	8.19
FLOURIDE	EPM	0.06	0.04	0.04	0.06	0.04
NITRATE	EPM	0.00	0.01	0.00	0.00	0.00
TOTAL CATIONS		13.20	13.76	11.30	13.47	10.80
TOTAL ANIONS		13.64	13.90	11.04	18.55	10.84
DEVIATION		103	101	97.70	138	100
TDS (calc.)		731	768	573	717	556
TDS @180		757	716	556	753	563
TOTAL HARDNESS		496	470	449	513	427
ALKALINITY		465	513	415	465	410
NON-CARB HARD		31.00	0.00	34.00	48.00	17.00
LAB CONDUCTIVITY		1111	1200	875	1100	850
FIELD COND.						
LAB pH		7.50	8.00	6.60	7.90	6.60
FIELD pH		6.10	6.40	6.01	7.60	6.40

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
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LAME DEER CREEK AT THE WEIR 2 of 7

DATE		051276	052576	062176	070876	072976
POTASSIUM	PPM	10.00	9.00	10.00	7.00	11.00
SODIUM	PPM	77.00	48.00	72.00	52.00	69.00
CALCIUM	PPM	74.00	69.00	119	66.00	68.00
MAGNESIUM	PPM	79.00	62.00	52.00	70.00	74.00
SULFATE	PPM	204	125	189	142	157
CHLORIDE	PPM	9.00	6.00	8.00	8.00	14.00
CARBONATE	PPM	0.00	0.00	18.00	48.00	84.00
BICARBONATE	PPM	573	506	555	415	403
FLOURIDE	PPM	0.90	0.70	0.90	0.80	0.90
SILICON DIO	PPM	13.00	18.00	6.00	18.00	20.00
TOTAL P	PPM	0.40	0.10	0.19	0.02	0.13
NITRATE	PPM	2.00	2.00	3.00	1.00	1.00
POTASSIUM	EPM	0.26	0.23	0.26	0.18	0.28
SODIUM	EPM	3.35	2.09	3.13	2.26	3.00
CALCIUM	EPM	3.69	3.44	5.94	3.29	3.39
MAGNESIUM	EPM	6.50	5.10	4.28	5.76	6.09
SULFATE	EPM	4.25	2.60	3.93	2.96	3.27
CHLORIDE	EPM	0.25	0.17	0.23	0.23	0.39
CARBONATE	EPM	0.00	0.00	0.60	1.60	2.80
BICARBONATE	EPM	9.39	8.29	9.10	6.80	6.61
FLOURIDE	EPM	0.05	0.04	0.05	0.04	0.05
NITRATE	EPM	0.01	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.80	10.86	13.60	11.49	12.76
TOTAL ANIONS		13.88	11.06	13.85	11.57	13.01
DEVIATION		101	102	102	101	102
TDS (calc.)		735	568	741	597	675
TDS @180		666	602	759	626	719
TOTAL HARDNESS		511	427	513	453	472
ALKALINITY		470	415	485	420	470
NON-CARB HARD		41.00	12.00	28.00	33.00	2.00
LAB CONDUCTIVITY		1100	800	1300	1300	1100
FIELD COND.						
LAB pH		7.60	7.70	8.00	8.40	8.30
FIELD pH		7.20	6.80	7.40	8.30	7.20

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK AT THE WEIR 3 of 7

DATE		090176	092176	101976	111576	121676
POTASSIUM	PPM	15.00	8.00	12.00	10.00	10.00
SODIUM	PPM	70.00	71.00	69.00	79.00	80.00
CALCIUM	PPM	119	146	148	210	166
MAGNESIUM	PPM	45.00	35.00	34.00	14.00	32.00
SULFATE	PPM	179	179	188	218	204
CHLORIDE	PPM	18.00	17.00	19.00	15.00	24.00
CARBONATE	PPM	66.00	60.00	48.00	96.00	84.00
BICARBONATE	PPM	427	451	439	464	415
FLOURIDE	PPM	0.90	0.90	0.80	0.90	1.00
SILICON DIO	PPM	21.00	20.00	19.00	22.00	15.00
TOTAL P	PPM	0.21	0.07	0.08	0.09	0.66
NITRATE	PPM	1.00	3.00	1.00	1.00	2.00
POTASSIUM	EPM	0.38	0.20	0.31	0.26	0.26
SODIUM	EPM	3.05	3.09	3.00	3.44	3.48
CALCIUM	EPM	5.94	7.29	7.39	10.48	8.28
MAGNESIUM	EPM	3.70	2.88	2.80	1.15	2.63
SULFATE	EPM	3.73	3.73	3.91	4.54	4.25
CHLORIDE	EPM	0.51	0.48	0.54	0.42	0.68
CARBONATE	EPM	2.20	2.00	1.60	3.20	2.80
BICARBONATE	EPM	7.00	7.39	7.20	7.60	6.80
FLOURIDE	EPM	0.05	0.05	0.04	0.05	0.05
NITRATE	EPM	0.00	0.00	0.00	0.00	0.01
TOTAL CATIONS		13.07	13.46	13.49	15.32	14.65
TOTAL ANIONS		13.35	13.52	13.15	15.70	14.41
DEVIATION		102	100	97.46	102	98.36
TDS (calc.)		722	738	734	870	804
TDS @180		733	731	791	827	888
TOTAL HARDNESS		481	507	507	583	547
ALKALINITY		460	470	440	540	480
NON-CARB HARD		21.00	37.00	67.00	43.00	67.00
LAB CONDUCTIVITY		1000	1149	1120	1280	1400
FIELD COND.						
LAB pH		9.40	8.80	8.00	8.80	8.40
FIELD pH		7.60	7.30		7.30	6.20

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LAME DEER CREEK AT THE WEIR 4 of 7

DATE		011977	021777	031477	042577	052377
POTASSIUM	PPM	9.00	10.00	10.00	11.00	12.00
SODIUM	PPM	93.00	75.00	56.00	80.00	80.00
CALCIUM	PPM	92.00	162	98.00	80.00	83.00
MAGNESIUM	PPM	72.00	26.00	69.00	80.00	84.00
SULFATE	PPM	220	205	203	224	208
CHLORIDE	PPM	18.00	20.00	12.00	13.00	12.00
CARBONATE	PPM	0.00	0.00	36.00	60.00	36.00
BICARBONATE	PPM	573	549	476	482	537
FLOURIDE	PPM	0.80	0.90	1.10	0.96	1.00
SILICON DIO	PPM	25.00	21.00	17.00	9.00	19.00
TOTAL P	PPM	0.73	0.42	0.30	0.15	0.18
NITRATE	PPM	2.00	2.00	4.90	0.10	1.50
POTASSIUM	EPM	0.23	0.26	0.26	0.28	0.31
SODIUM	EPM	4.05	3.26	2.44	3.48	3.48
CALCIUM	EPM	4.59	8.08	4.89	3.99	4.14
MAGNESIUM	EPM	5.92	2.14	5.68	6.58	6.91
SULFATE	EPM	4.58	4.27	4.23	4.66	4.33
CHLORIDE	EPM	0.51	0.56	0.34	0.37	0.34
CARBONATE	EPM	0.00	0.00	1.20	2.00	1.20
BICARBONATE	EPM	9.39	9.00	7.80	7.90	8.80
FLOURIDE	EPM	0.04	0.05	0.06	0.05	0.05
NITRATE	EPM	0.01	0.01	0.00	0.00	0.00
TOTAL CATIONS		14.79	13.74	13.26	14.33	14.84
TOTAL ANIONS		14.40	13.74	13.53	14.89	14.64
DEVIATION		97.37	99.97	102	104	98.64
TDS (calc.)		786	768	718	785	779
TDS @180		607	774	708	780	788
TOTAL HARDNESS		525	512	527	529	551
ALKALINITY		470	450	450	495	500
NON-CARB HARD		55.00	62.00	77.00	34.00	51.00
LAB CONDUCTIVITY		1240	1160	1090	1216	1215
FIELD COND.						
LAB pH		8.30	8.30	8.80	8.30	8.40
FIELD pH		8.00			8.20	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK AT THE WEIR 5 of 7

DATE		061377	072077	082277	020679	032179
POTASSIUM	PPM	9.00	11.00	8.00	25.00	10.00
SODIUM	PPM	85.00	80.00	90.00	103	90.00
CALCIUM	PPM	89.00	79.00	77.00	83.00	77.00
MAGNESIUM	PPM	70.00	76.00	77.00	93.00	93.00
SULFATE	PPM	190	193	185	290	290
CHLORIDE	PPM	14.00	17.00	20.00	23.00	16.00
CARBONATE	PPM	24.00	60.00	72.00	0.00	0.00
BICARBONATE	PPM	512	451	439	634	598
FLOURIDE	PPM	1.00	0.93	0.92		
SILICON DIO	PPM	20.00	23.00	22.00		
TOTAL P	PPM	0.34	0.02	0.27	0.46	0.25
NITRATE	PPM	0.20	0.50	0.30	0.78	0.86
POTASSIUM	EPM	0.23	0.28	0.20	0.64	0.26
SODIUM	EPM	3.70	3.48	3.91	4.48	3.91
CALCIUM	EPM	4.44	3.94	3.84	4.14	3.84
MAGNESIUM	EPM	5.76	6.25	6.33	7.65	7.65
SULFATE	EPM	3.96	4.02	3.85	6.04	6.04
CHLORIDE	EPM	0.39	0.48	0.56	0.65	0.45
CARBONATE	EPM	0.80	2.00	2.40	0.00	0.00
BICARBONATE	EPM	8.39	7.39	7.20	10.39	9.80
FLOURIDE	EPM	0.05	0.05	0.05		
NITRATE	EPM	0.01	0.00	0.00	0.01	0.00
TOTAL CATIONS		14.13	13.96	14.30	16.91	15.66
TOTAL ANIONS		13.50	13.81	13.92	69.50	68.76
DEVIATION		95.54	98.98	97.34	411	439
TDS (calc.)		733	738	745	929	870
TDS @180		736	800	787	964	853
TOTAL HARDNESS		508	507	507	588	573
ALKALINITY		460	470	480	520	490
NON-CARB HARD		48.00	37.00	27.00	68.00	83.00
LAB CONDUCTIVITY		1196	1078	1152	1280	1300
FIELD COND.				950		800
LAB pH		8.40	8.30	8.60	7.80	8.10
FIELD pH			8.50	8.60		

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK AT THE WEIR 6 of 7

DATE		040479	050879	072079	072079	082279
POTASSIUM	PPM	14.00	12.00	11.00	11.00	17.00
SODIUM	PPM	94.00	107	88.00	88.00	80.00
CALCIUM	PPM	97.00	89.00	79.00	79.00	121
MAGNESIUM	PPM	87.00	101	86.00	86.00	58.00
SULFATE	PPM	295	296	235	235	226
CHLORIDE	PPM	17.00	20.00	21.00	21.00	20.00
CARBONATE	PPM	0.00	60.00	60.00	60.00	0.00
BICARBONATE	PPM	622	537	427	427	598
FLOURIDE	PPM					
SILICON DIO	PPM					
TOTAL P	PPM	0.20	0.23	0.34	0.34	0.01
NITRATE	PPM	0.21	0.10	0.35	0.35	0.20
POTASSIUM	EPM	0.36	0.31	0.28	0.28	0.43
SODIUM	EPM	4.09	4.65	3.83	3.83	3.48
CALCIUM	EPM	4.84	4.44	3.94	3.94	6.04
MAGNESIUM	EPM	7.16	8.31	7.07	7.07	4.77
SULFATE	EPM	6.14	6.16	4.89	4.89	4.71
CHLORIDE	EPM	0.48	0.56	0.59	0.59	0.56
CARBONATE	EPM	0.00	2.00	2.00	2.00	0.00
BICARBONATE	EPM	10.19	8.80	7.00	7.00	9.80
FLOURIDE	EPM					
NITRATE	EPM	0.00	0.00	0.01	0.01	0.00
TOTAL CATIONS		16.44	17.71	15.13	15.13	14.72
TOTAL ANIONS		69.28	69.97	66.92	66.92	67.51
DEVIATION		421	395	442	442	459
TDS (calc.)		910	949	790	790	816
TDS @180		823	970	838	838	823
TOTAL HARDNESS		598	637	549	549	540
ALKALINITY		510	540	450	450	490
NON-CARB HARD		88.00	97.00	99.00	99.00	50.00
LAB CONDUCTIVITY		1260	1380	1400	1400	1180
FIELD COND.			1000			910
LAB pH		8.30	8.40	8.40	8.40	8.00
FIELD pH					7.28	7.40

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
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LAME DEER CREEK AT THE WEIR 7 of 7

DATE		091879	MEAN	ST.DEV	#
POTASSIUM	PPM	14.00	10.94	11.61	31.00
SODIUM	PPM	65.00	75.81	225	31.00
CALCIUM	PPM	99.00	101	1310	31.00
MAGNESIUM	PPM	83.00	66.10	495	31.00
SULFATE	PPM	237	205	2061	31.00
CHLORIDE	PPM	19.00	14.97	31.71	31.00
CARBONATE	PPM	0.00	34.65	1014	31.00
BICARBONATE	PPM	586	513	5840	31.00
FLOURIDE	PPM		0.90	0.01	23.00
SILICON DIO	PPM		17.78	20.17	23.00
TOTAL P	PPM	0.14	0.21	0.04	31.00
NITRATE	PPM	0.10	0.91	1.84	31.00
POTASSIUM	EPM	0.36	0.28		
SODIUM	EPM	2.83	3.30		
CALCIUM	EPM	4.94	5.02		
MAGNESIUM	EPM	6.83	5.44		
SULFATE	EPM	4.93	4.27		
CHLORIDE	EPM	0.54	0.42		
CARBONATE	EPM	0.00	1.15		
BICARBONATE	EPM	9.60	8.41		
FLOURIDE	EPM		0.05		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		14.95	14.03	2.49	31.00
TOTAL ANIONS		67.52	27.75	574	31.00
DEVIATION		452	187	21111	31.00
TDS (calc.)		805	756	8966	31.00
TDS @180		840	762	10014	31.00
TOTAL HARDNESS		589	521	2408	31.00
ALKALINITY		480	472	1078	31.00
NON-CARB HARD		109	50.48	827	31.00
LAB CONDUCTIVITY		1200	1175	22199	31.00
FIELD COND.		1790	1090	126840	5.00
LAB pH		7.80	8.15	0.31	31.00
FIELD pH			7.29	0.59	20.00

BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
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TYPING GUIDE SHEET
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CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD: BEGIN SECTIONS HERE
6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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(4-75)

Lame Deer Creek #2

Lame Deer Creek #2 was a miscellaneous water quality sampling site located about 5 miles upstream from Lame Deer at the Northern Cheyenne Pow-Wow Grounds in the SW,SE, Sec. 13, T3S, R41E. The site is just below the confluence of the East Fork and South Fork at Lame Deer Creek. Stream discharge was usually not measured. The period of water quality data collection was from December, 1975 to September, 1977.

LAME DEER CREEK #2 1 of 6

DATE		121775	012276	030376	032576	050276
POTASSIUM	PPM	9.00	7.00	11.00	8.00	11.00
SODIUM	PPM	45.00	48.00	81.00	41.00	78.00
CALCIUM	PPM	72.00	70.00	81.00	58.00	72.00
MAGNESIUM	PPM	64.00	63.00	91.00	68.00	87.00
SULFATE	PPM	121	114	206	102	206
CHLORIDE	PPM	6.00	6.00	5.00	4.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	512	519	628	506	610
FLOURIDE	PPM	0.90	0.80	0.90	0.90	1.00
SILICON DIO	PPM	16.00	15.00	19.00	12.00	7.00
TOTAL P	PPM	0.10	0.03	0.31	0.10	0.10
NITRATE	PPM	2.10	2.00	2.00	1.00	1.00
POTASSIUM	EPM	0.23	0.18	0.28	0.20	0.28
SODIUM	EPM	1.96	2.09	3.52	1.78	3.39
CALCIUM	EPM	3.59	3.49	4.04	2.89	3.59
MAGNESIUM	EPM	5.26	5.18	7.49	5.59	7.16
SULFATE	EPM	2.52	2.37	4.29	2.12	4.29
CHLORIDE	EPM	0.17	0.17	0.14	0.11	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.39	8.51	10.29	8.29	10.00
FLOURIDE	EPM	0.05	0.04	0.05	0.05	0.05
NITRATE	EPM	0.00	0.00	0.01	0.00	0.00
TOTAL CATIONS		11.05	10.94	15.33	10.48	14.42
TOTAL ANIONS		11.08	11.05	14.74	10.55	14.55
DEVIATION		100	101	96.13	101	101
TDS (calc.)		585	563	791	531	764
TDS @180		594	541	841	604	791
TOTAL HARDNESS		444	433	575	423	538
ALKALINITY		420	425	515	415	500
NON-CARB HARD		24.00	8.00	0.00	8.00	38.00
LAB CONDUCTIVITY		2128	900	1080	1000	1200
FIELD COND.						
LAB pH		7.70	7.80	7.80	8.30	7.20
FIELD pH		7.60	6.30	7.80	5.80	7.20

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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LAME DEER CREEK #2 2 of 6

DATE		052576	062176	072976	090176	092076
POTASSIUM	PPM	10.00	8.00	9.00	10.00	8.00
SODIUM	PPM	78.00	48.00	49.00	55.00	50.00
CALCIUM	PPM	70.00	73.00	72.00	111	150
MAGNESIUM	PPM	82.00	60.00	60.00	47.00	17.00
SULFATE	PPM	195	118	105	123	109
CHLORIDE	PPM	9.00	3.00	8.00	14.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	24.00	0.00
BICARBONATE	PPM	580	512	525	525	549
FLOURIDE	PPM	0.90	0.90	0.70	0.80	0.70
SILICON DIO	PPM	13.00	12.00	22.00	21.00	26.00
TOTAL P	PPM	0.40	0.03	0.02	0.09	0.02
NITRATE	PPM	2.00	1.00	2.00	1.00	1.00
POTASSIUM	EPM	0.26	0.20	0.23	0.26	0.20
SODIUM	EPM	3.39	2.09	2.13	2.39	2.18
CALCIUM	EPM	3.49	3.64	3.59	5.54	7.48
MAGNESIUM	EPM	6.75	4.94	4.94	3.87	1.40
SULFATE	EPM	4.06	2.46	2.19	2.56	2.27
CHLORIDE	EPM	0.25	0.08	0.23	0.39	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.80	0.00
BICARBONATE	EPM	9.51	8.39	8.60	8.60	9.00
FLOURIDE	EPM	0.05	0.05	0.04	0.04	0.04
NITRATE	EPM	0.01	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.89	10.87	10.89	12.05	11.26
TOTAL ANIONS		13.81	10.96	10.99	12.30	11.51
DEVIATION		99.43	101	101	102	102
TDS (calc.)		729	562	561	642	614
TDS @180		783	594	585	627	594
TOTAL HARDNESS		512	426	424	471	443
ALKALINITY		475	420	430	470	450
NON-CARB HARD		37.00	6.00	0.00	1.00	0.00
LAB CONDUCTIVITY		1200	1100	950	900	700
FIELD COND.						
LAB pH		7.70	7.10	7.80	8.50	8.00
FIELD pH		7.60	6.50	6.40	8.00	7.10

BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

PAGE NUMBER
EPA-287 (Cin.)
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LAME DEER CREEK #2 3 of 6

DATE		101976	111576	121676	011977	021777
POTASSIUM	PPM	9.00	7.00	10.00	6.00	7.00
SODIUM	PPM	50.00	50.00	44.00	53.00	53.00
CALCIUM	PPM	112	162	92.00	88.00	114
MAGNESIUM	PPM	41.00	11.00	53.00	53.00	36.00
SULFATE	PPM	119	123	118	123	120
CHLORIDE	PPM	10.00	10.00	5.00	6.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	500	525	512	500	488
FLOURIDE	PPM	0.70	0.70	0.80	0.80	0.80
SILICON DIO	PPM	22.00	22.00	24.00	25.00	24.00
TOTAL P	PPM	0.02	0.03	0.06	0.21	0.02
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.23	0.18	0.26	0.15	0.18
SODIUM	EPM	2.18	2.18	1.91	2.31	2.31
CALCIUM	EPM	5.59	8.08	4.59	4.39	5.69
MAGNESIUM	EPM	3.37	0.90	4.36	4.36	2.96
SULFATE	EPM	2.48	2.56	2.46	2.56	2.50
CHLORIDE	EPM	0.28	0.28	0.14	0.17	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.19	8.60	8.39	8.19	8.00
FLOURIDE	EPM	0.04	0.04	0.04	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.37	11.34	11.12	11.21	11.13
TOTAL ANIONS		10.92	11.41	11.00	10.93	10.77
DEVIATION		96.05	101	98.88	97.47	96.71
TDS (calc.)		587	621	574	575	581
TDS @180		599	581	597	618	588
TOTAL HARDNESS		447	448	446	436	432
ALKALINITY		410	430	420	410	400
NON-CARB HARD		37.00	18.00	26.00	26.00	32.00
LAB CONDUCTIVITY		950	980	980	960	920
FIELD COND.						
LAB pH		7.50	8.30	8.20	7.90	7.80
FIELD pH			7.30	6.10	7.30	

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LAME DEER CREEK #2 4 of 6

DATE		031477	042577	052377	061377	072077
POTASSIUM	PPM	7.00	7.00	8.00	7.00	8.00
SODIUM	PPM	45.00	51.00	52.00	52.00	50.00
CALCIUM	PPM	88.00	77.00	71.00	89.00	67.00
MAGNESIUM	PPM	50.00	71.00	67.00	54.00	57.00
SULFATE	PPM	116	193	120	118	123
CHLORIDE	PPM	5.00	6.00	7.00	7.00	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	494	506	512	500	488
FLOURIDE	PPM	0.90	0.74	0.73	0.84	0.77
SILICON DIO	PPM	23.00	22.00	25.00	23.00	27.00
TOTAL P	PPM	0.02	0.07	0.01	0.07	0.03
NITRATE	PPM	1.10	0.70	1.00	0.70	1.20
POTASSIUM	EPM	0.18	0.18	0.20	0.18	0.20
SODIUM	EPM	1.96	2.22	2.26	2.26	2.18
CALCIUM	EPM	4.39	3.84	3.54	4.44	3.34
MAGNESIUM	EPM	4.11	5.84	5.51	4.44	4.69
SULFATE	EPM	2.42	4.02	2.50	2.46	2.56
CHLORIDE	EPM	0.14	0.17	0.20	0.20	0.17
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.10	8.29	8.39	8.19	8.00
FLOURIDE	EPM	0.05	0.04	0.04	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		10.64	12.08	11.52	11.32	10.41
TOTAL ANIONS		10.66	12.48	11.07	10.84	10.73
DEVIATION		100	103	96.12	95.75	103
TDS (calc.)		554	654	577	573	551
TDS @180		539	606	582	601	595
TOTAL HARDNESS		426	481	454	444	400
ALKALINITY		405	415	420	410	400
NON-CARB HARD		21.00	66.00	34.00	34.00	0.00
LAB CONDUCTIVITY		870	941	960	960	970
FIELD COND.						
LAB pH		8.30	7.80	7.90	7.80	7.40
FIELD pH			7.20			7.40

EPA-287 (Cin.)
(4-76)

LAME DEER CREEK #2 5 of 6

DATE		082277	092777
POTASSIUM	PPM	10.00	10.00
SODIUM	PPM	70.00	80.00
CALCIUM	PPM	91.00	87.00
MAGNESIUM	PPM	46.00	52.00
SULFATE	PPM	137	132
CHLORIDE	PPM	8.00	7.00
CARBONATE	PPM	0.00	0.00
BICARBONATE	PPM	500	549
FLOURIDE	PPM	0.76	0.60
SILICON DIO	PPM	25.00	25.00
TOTAL P	PPM	0.02	0.10
NITRATE	PPM	0.50	0.10
POTASSIUM	EPM	0.26	0.26
SODIUM	EPM	3.05	3.48
CALCIUM	EPM	4.54	4.34
MAGNESIUM	EPM	3.78	4.28
SULFATE	EPM	2.85	2.75
CHLORIDE	EPM	0.23	0.20
CARBONATE	EPM	0.00	0.00
BICARBONATE	EPM	8.19	9.00
FLOURIDE	EPM	0.04	0.03
NITRATE	EPM	0.00	0.00
TOTAL CATIONS		11.63	12.35
TOTAL ANIONS		11.25	11.93
DEVIATION		96.81	96.53
TDS (calc.)		608	638
TDS @180		588	599
TOTAL HARDNESS		415	434
ALKALINITY		410	450
NON-CARB HARD		5.00	0.00
LAB CONDUCTIVITY		902	941
FIELD COND.		650	690
LAB pH		8.20	7.80
FIELD pH		7.70	7.40

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LAME DEER CREEK #2 6 of 6

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	8.50	2.07	22.00
SODIUM	PPM	55.59	153	22.00
CALCIUM	PPM	89.41	660	22.00
MAGNESIUM	PPM	55.91	360	22.00
SULFATE	PPM	134	1038	22.00
CHLORIDE	PPM	7.41	6.61	22.00
CARBONATE	PPM	1.09	24.99	22.00
BICARBONATE	PPM	525	1347	22.00
FLOURIDE	PPM	0.80	0.01	22.00
SILICON DIO	PPM	20.45	28.88	22.00
TOTAL P	PPM	0.07	0.01	22.00
NITRATE	PPM	0.88	0.83	22.00
POTASSIUM	EPM	0.22		
SODIUM	EPM	2.42		
CALCIUM	EPM	4.46		
MAGNESIUM	EPM	4.60		
SULFATE	EPM	2.78		
CHLORIDE	EPM	0.21		
CARBONATE	EPM	0.04		
BICARBONATE	EPM	8.60		
FLOURIDE	EPM	0.04		
NITRATE	EPM	0.00		
TOTAL CATIONS		11.70	1.56	22.00
TOTAL ANIONS		11.61	1.45	22.00
DEVIATION		99.36	5.85	22.00
TDS (calc.)		611	4603	22.00
TDS @180		620	5846	22.00
TOTAL HARDNESS		452	1637	22.00
ALKALINITY		432	972	22.00
NON-CARB HARD		19.14	305	22.00
LAB CONDUCTIVITY		1022	69052	22.00
FIELD COND.		670	400	2.00
LAB pH		7.85	0.12	22.00
FIELD pH		7.10	0.39	17.00

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

MUDDY CREEK #1 --WATER YEAR 1979

STATION DESCRIPTION

Culvert gaging house, Leopold Stevens A-71 recorder with float, staff gage. Cross section is stabilized by a concrete bag weir. The station is located in NE 1/4 SE1/4, Section 2, T.3S., R.40 E., on the Northern Cheyenne Reservation, approximately two miles upstream from its mounth.

PERIOD OF OPERATION

May 1978 to the current year.

STAGE DISCHARGE CURVE

The stage discharge relationship used was developed from twelve discharge measurements taken during the current year. The relationship is well defined between 2 and 30 cfs. The stage discharge curve is concave upward, and was approximated by two linear sections. For flows less than 9 cfs, the following relationship defined by four measurements was used:

$$\log(Q) = \log(\text{stage})*5.68812 + 1.51862 \qquad r=.991$$

For flows greater than 9 cfs, the following relationship defined by five measurements was used:

$$\log(Q) = \log(\text{stage})*4.08469 + 1.75766 \qquad r=.995$$

MALFUNCTIONS AND MISSING RECORDS

Record is good except for time when float was frozen which was from February 6 to March 15. The weir was open for most of the winter.

No beaver dams were present below the weir during this water year.

INTERPRETATION NOTES

It was assumed that winter flows were constant during February and early March. Linear interpolation was used to compute daily discharges during the period March 7 to March 15.

For an unknown reason, the stage discharge relationship shifted downward 0.09 feet during the winter.

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA 287 (Cin.)
(4-76)

MUDDY CREEK # 1

WATER YEAR 1979

AVERAGE DAILY DISCHARGE

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6	6	6	6	5	5	8	26	19	14	4	2
2	6	6	6	6	5	5	8	26	16	13	4	2
3	6	6	6	6	5	5	8	24	15	13	3	2
4	6	6	6	6	5	5	9	24	14	12	3	2
5	6	6	6	6	5	5	9	24	14	11	3	2
6	6	6	6	6	5	5	9	24	13	11	4	2
7	6	6	6	6	5	5	11	25	13	10	4	2
8	6	6	6	6	5	5	12	22	13	9	4	2
9	6	6	6	6	5	5	14	22	12	7	4	2
10	6	6	6	6	5	6	17	22	12	7	4	2
11	6	6	6	6	5	6	19	22	11	6	4	2
12	6	6	6	6	5	6	20	21	11	5	4	3
13	6	6	6	6	5	7	19	20	10	5	4	3
14	6	6	6	6	5	7	17	20	9	5	4	3
15	6	6	6	6	5	7	18	20	9	5	4	3
16	6	6	6	6	5	10	20	19	9	5	4	3
17	5	6	6	6	5	10	23	19	9	5	3	3
18	6	6	6	6	5	10	34	19	10	5	3	2
19	6	6	6	6	5	10	46	18	12	5	3	2
20	6	6	6	6	5	10	47	17	12	4	3	2
21	6	6	6	6	5	9	38	17	12	4	3	2
22	6	6	6	6	5	11	32	16	13	4	3	2
23	6	6	6	6	5	11	31	16	12	5	3	2
24	6	6	6	6	5	11	33	15	12	5	3	2
25	6	6	6	5	5	11	30	16	12	9	3	2
26	6	6	6	5	5	9	30	15	12	9	3	2
27	6	6	6	5	5	8	30	15	22	7	3	2
28	6	6	6	5	5	9	30	14	29	6	3	2
29	6	6	6	5		8	28	15	20	5	3	2
30	6	6	6	5		8	27	20	15	5	3	2
31	6		6	5		8		21		5	2	
MEAN	6	6	6	6	5	8	22	20	13	7	3	2
MAX	6	6	6	6	5	11	47	26	29	14	4	3
MIN	5	6	6	5	5	5	8	14	9	4	2	2

MEAN FOR YEAR IS: 9

MUDDY CREEK #1

STATION DESCRIPTION

Culvert gaging house, Leopold Stevens A-71 recorder, staff gage, and stabilized channel created by a cement bag weir. The station is located in NE 1/4 SE 1/4, Section 2, T.3 S., R.40 E., approximately two miles upstream from the mouth on the right bank on the Northern Cheyenne Reservation.

PERIOD OF OPERATION

Meaningful records were not obtained until May 21 of this year.

STAGE DISCHARGE CURVE

6-1/2"

The stage discharge relationship developed in water year 1979 was used to interpret the water records from this water year. No discharge measurements were taken during this year.

MALFUNCTIONS AND MISSING RECORDS

The float and recorder worked fine from May to the end of the water year.

INTERPRETATION NOTES

Caculation of daily discharges could not be done with any accuracy because no discharge measurements were taken during the water year and because of the effects of downstream beaver dams.

As best as can be determined, a beaver dam was flooding out the weir for the entire year. The flood in May probably destroyed most of the beaver dam. A rough interpretation of stage was made using the following assumptions: 1) stage-discharge curve same as in 1979, and 2) beaver dam had only a small effect (< 0.07') on stage after May, 1978 (when remnants of dams were destroyed on October 23,1978, water level at the weir fell 0.07').

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

MUDDY CREEK #1

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									156	53	21	11
2									151	56	20	11
3									125	52	20	10
4									115	51	20	8
5									137	49	19	7
6									122	52	18	7
7									105	51	17	6
8									94	48	16	6
9									91	44	16	7
10									85	44	15	7
11									83	43	15	8
12									78	44	15	13
13									75	42	14	18
14									72	37	14	13
15									68	35	15	11
16									67	34	15	11
17									70	32	15	11
18									72	31	14	13
19								544	67	33	14	15
20								870	63	37	13	15
21								495	60	36	13	12
22								351	63	33	12	11
23								261	67	30	12	9
24								218	60	26	11	8
25								180	58	26	11	7
26								159	61	24	11	7
27								137	58	22	11	7
28								127	56	22	11	6
29								115	53	24	11	6
30								127	51	22	11	6
31								143		22	10	
MEAN								287	83	37	15	10
MAX								870	156	56	21	18
MIN								115	51	22	10	6

MEAN FOR YEAR IS: 86

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Muddy Creek at Highway 212 Bridge

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
07-09-76	7.2	All measurements were taken 30 feet upstream from the Highway 212 bridge, one mile below the Muddy Creek #1 weir.
08-13-76	2.5	
09-14-76	2.5	
10-27-76	3.1	
11-24-76	2.7	
12-16-76	2.4	
01-18-77	2.5	
02-14-77	3.4	
03-14-77	3.3	
04-26-77	8.2	
05-03-77	8.2	
06-13-77	3.0	
07-06-77	3.7	
11-01-77	2.2	

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

MUDDY CREEK #1

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 20	FEB 14	MAR 7	MAR 16	APR 4	APR 24	APR 27	MAY 10
DISCHARGE......	6.30	4.60	5.63	11	9.27	22	31	22
GAGE HEIGHT....	1.14		1.36	1.15	1.13	1.53	1.50	1.39
ADJ. GAGE HT...								
WIDTH..........	12	11	12	13	13	16	16	13
AREA...........		2.65	3.28	4.71	4.96	10	9.72	7.40
MEAN DEPTH.....		0.25	0.27	0.37	0.39	0.66	0.61	0.57
MEAN VELOCITY..		1.67	1.72	2.35	1.87	2.13	3.19	2.95
# OF SECTIONS..		22	24	25	25		6.00	27
CHANGE IN G.HT.			0.20	0.01				
TIME...........		1.45	1.15	1.30	0.45	1.00	1.00	1.00
TEMPERATURE....		0.10		1.00	3.00			
METER TYPE.....	PYG	PYG	PYG	PYG	PYG	PYG	PYG	PYG
FREE OR ICE....		ICE						
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	JWM	TJO	CBA	CBA	TJO	JWM

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

MUDDY CREEK #1

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 6	JUL 19	AUG 22	SEP 18
DISCHARGE......	12	4.27	3.55	2.37
GAGE HEIGHT....	1.20	1.00	0.94	0.90
ADJ. GAGE HT...				
WIDTH..........	13	12	11	12
AREA...........		2.96	2.51	2.09
MEAN DEPTH.....		0.25	0.22	0.17
MEAN VELOCITY..		1.39	1.33	1.08
# OF SECTIONS..	26	24	23	22
CHANGE IN G.HT.				
TIME...........	1.00	1.00	1.00	1.00
TEMPERATURE....		21	16	12
METER TYPE.....	PYG	PYG	PYG	PYG
FREE OR ICE....				
SUSPENSION.....	ROD	ROD	ROD	ROD
GAGED BY.......	JWM	JWM	JWM	JWM

EPA-287 (Cln.)
(4-76)

MUDDY CREEK #1 1 of 7

DATE		012876	030376	033176	042676	052676
POTASSIUM	PPM	8.00	10.00	10.00	8.00	10.00
SODIUM	PPM	89.00	98.00	95.00	62.00	78.00
CALCIUM	PPM	96.00	86.00	100.00	74.00	79.00
MAGNESIUM	PPM	111	115	103	95.00	102
SULFATE	PPM	393	417	398	300	365
CHLORIDE	PPM	5.00	6.00	8.00	5.00	5.00
CARBONATE	PPM	0.00	36.00	0.00	0.00	0.00
BICARBONATE	PPM	604	549	567	500	512
FLOURIDE	PPM	0.80	0.70	0.70	0.60	0.60
SILICON DIO	PPM	17.00	13.00	8.00	10.00	8.00
TOTAL P	PPM	0.15	0.01	0.10	0.10	0.10
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.20	0.26	0.26	0.20	0.26
SODIUM	EPM	3.87	4.26	4.13	2.70	3.39
CALCIUM	EPM	4.79	4.29	4.99	3.69	3.94
MAGNESIUM	EPM	9.13	9.46	8.47	7.81	8.39
SULFATE	EPM	8.18	8.68	8.29	6.25	7.60
CHLORIDE	EPM	0.14	0.17	0.23	0.14	0.14
CARBONATE	EPM	0.00	1.20	0.00	0.00	0.00
BICARBONATE	EPM	9.90	9.00	9.29	8.19	8.39
FLOURIDE	EPM	0.04	0.04	0.04	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		18.00	18.27	17.85	14.41	15.98
TOTAL ANIONS		18.23	19.04	17.78	14.58	16.12
DEVIATION		101	104	99.61	101	101
TDS (calc.)			1038	993	790	891
TDS @180		1058	1049	958	820	929
TOTAL HARDNESS		845	689	675	575	617
ALKALINITY		495	510	465	410	420
NON-CARB HARD		350	179	210	165	197
LAB CONDUCTIVITY		1500	1700	1400	1200	1300
FIELD COND.						
LAB pH		8.20	8.60	7.80	7.00	7.60
FIELD pH		6.30	7.90	7.00	7.20	7.50

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"
9-1/2"
9-1/8"

EPA-287 (Cin.)
(4-76)

MUDDY CREEK 2 of 7

DATE		062476	070976	072976	090276	092276
POTASSIUM	PPM	15.00	8.00	10.00	15.00	12.00
SODIUM	PPM	68.00	70.00	79.00	94.00	92.00
CALCIUM	PPM	76.00	74.00	74.00	146	234
MAGNESIUM	PPM	93.00	108	95.00	63.00	18.00
SULFATE	PPM	317	376	328	380	384
CHLORIDE	PPM	5.00	6.00	8.00	12.00	11.00
CARBONATE	PPM	36.00	36.00	106	48.00	48.00
BICARBONATE	PPM	451	427	322	476	500
FLOURIDE	PPM	0.50	0.60	0.60	0.70	0.70
SILICON DIO	PPM	13.00	10.00	11.00	11.00	17.00
TOTAL P	PPM	0.05	0.05	0.04	0.02	0.03
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.38	0.20	0.26	0.38	0.31
SODIUM	EPM	2.96	3.05	3.44	4.09	4.00
CALCIUM	EPM	3.79	3.69	3.69	7.29	11.68
MAGNESIUM	EPM	7.65	8.88	7.81	5.18	1.48
SULFATE	EPM	6.60	7.83	6.83	7.91	7.99
CHLORIDE	EPM	0.14	0.17	0.23	0.34	0.31
CARBONATE	EPM	1.20	1.20	3.53	1.60	1.60
BICARBONATE	EPM	7.39	7.00	5.28	7.80	8.19
FLOURIDE	EPM	0.03	0.03	0.03	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.78	15.83	15.20	16.94	17.47
TOTAL ANIONS		15.32	16.18	15.84	17.60	18.06
DEVIATION		104	102	104	104	103
TDS (calc.)		832	888	859	992	1045
TDS @180		872	941	920	986	994
TOTAL HARDNESS		570	629	573	623	658
ALKALINITY		430	410	440	470	490
NON-CARB HARD		140	219	133	153	168
LAB CONDUCTIVITY		1200	1700	1300	1250	1000
FIELD COND.						
LAB pH		8.50	8.30	8.30	9.10	8.80
FIELD pH		6.90	7.90	6.60	7.80	7.10

EPA-287 (Cin.)
(4-76)

MUDDY CREEK 3 of 7

DATE		102676	111576	121576	011977	021777
POTASSIUM	PPM	11.00	11.00	10.00	8.00	10.00
SODIUM	PPM	91.00	114	100.00	69.00	90.00
CALCIUM	PPM	238	280	226	122	160
MAGNESIUM	PPM	25.00	22.00	34.00	106	64.00
SULFATE	PPM	393	475	402	404	379
CHLORIDE	PPM	15.00	14.00	13.00	1.00	13.00
CARBONATE	PPM	0.00	48.00	72.00	0.00	0.00
BICARBONATE	PPM	549	573	439	561	537
FLOURIDE	PPM	0.60	0.08	0.70	0.90	0.70
SILICON DIO	PPM	15.00	16.00	13.00	19.00	16.00
TOTAL P	PPM	0.02	0.03	0.07	0.02	0.07
NITRATE	PPM	1.00	2.00	2.00	1.00	1.00
POTASSIUM	EPM	0.28	0.28	0.26	0.20	0.26
SODIUM	EPM	3.96	4.96	4.35	3.00	3.91
CALCIUM	EPM	11.88	13.97	11.28	6.09	7.98
MAGNESIUM	EPM	2.06	1.81	2.80	8.72	5.26
SULFATE	EPM	8.18	9.89	8.37	8.41	7.89
CHLORIDE	EPM	0.42	0.39	0.37	0.03	0.37
CARBONATE	EPM	0.00	1.60	2.40	0.00	0.00
BICARBONATE	EPM	9.00	9.39	7.20	9.19	8.80
FLOURIDE	EPM	0.03	0.00	0.04	0.05	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		18.17	21.02	18.68	18.01	17.42
TOTAL ANIONS		17.52	21.18	18.27	17.67	17.00
DEVIATION		96.43	101	97.82	98.12	97.60
TDS (calc.)		1043	1246	1073	986	980
TDS @180		1102	1235	1076	1031	1017
TOTAL HARDNESS		697	787	702	738	660
ALKALINITY		450	550	480	460	440
NON-CARB HARD		247	237	222	278	220
LAB CONDUCTIVITY		1600	1550	1400	1480	1400
FIELD COND.						
LAB pH		7.80	8.80	8.30	8.10	8.30
FIELD pH		6.20	7.10	6.00	8.20	8.30

PAGE NUMBER
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(4-76)

MUDDY CREEK 4 of 7

DATE		032377	042577	052377	052577	061477
POTASSIUM	PPM	12.00	6.00	8.00	8.00	10.00
SODIUM	PPM	90.00	58.00	80.00	80.00	70.00
CALCIUM	PPM	84.00	90.00	104	162	104
MAGNESIUM	PPM	99.00	79.00	91.00	48.00	84.00
SULFATE	PPM	379	305	346	355	337
CHLORIDE	PPM	6.00	5.00	6.00	9.00	8.00
CARBONATE	PPM	36.00	48.00	54.00	30.00	48.00
BICARBONATE	PPM	476	366	409	439	409
FLOURIDE	PPM	0.70	0.45	0.55	0.56	0.62
SILICON DIO	PPM	13.00	10.00	13.00	9.00	12.00
TOTAL P	PPM	0.03	0.07	0.04	0.38	0.08
NITRATE	PPM	0.10	0.20	0.54	0.32	0.20
POTASSIUM	EPM	0.31	0.15	0.20	0.20	0.26
SODIUM	EPM	3.91	2.52	3.48	3.48	3.05
CALCIUM	EPM	4.19	4.49	5.19	8.08	5.19
MAGNESIUM	EPM	8.14	6.50	7.49	3.95	6.91
SULFATE	EPM	7.89	6.35	7.20	7.39	7.02
CHLORIDE	EPM	0.17	0.14	0.17	0.25	0.23
CARBONATE	EPM	1.20	1.60	1.80	1.00	1.60
BICARBONATE	EPM	7.80	6.00	6.70	7.20	6.70
FLOURIDE	EPM	0.04	0.02	0.03	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.01	0.00
TOTAL CATIONS		16.56	13.67	16.36	15.72	15.40
TOTAL ANIONS		17.05	14.08	15.86	15.81	15.52
DEVIATION		103	103	96.96	101	101
TDS (calc.)		940	771	890	908	862
TDS @180		1002	784	880	950	922
TOTAL HARDNESS		618	549	634	602	605
ALKALINITY		450	380	425	410	415
NON-CARB HARD		168	169	209	192	190
LAB CONDUCTIVITY		1400	1159	1274	1430	1267
FIELD COND.						
LAB pH		8.30	8.30	8.40	8.30	8.30
FIELD pH			8.20			

1/2''
9-1/8''
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

MUDDY CREEK 5 of 7

DATE		082277	072877	020679	032279	040479
POTASSIUM	PPM	13.00	11.00	16.00	9.00	12.00
SODIUM	PPM	110	80.00	105	89.00	89.00
CALCIUM	PPM	120	73.00	113	123	99.00
MAGNESIUM	PPM	84.00	108	114	109	122
SULFATE	PPM	384	356	498	481	488
CHLORIDE	PPM	11.00	8.00	8.00	11.00	10.00
CARBONATE	PPM	48.00	45.00	0.00	48.00	0.00
BICARBONATE	PPM	464	433	586	476	561
FLOURIDE	PPM	0.62	0.60			
SILICON DIO	PPM	11.00	16.00			
TOTAL P	PPM	0.04	0.06	0.17	0.07	0.01
NITRATE	PPM	0.10	0.50	0.79	0.66	0.28
POTASSIUM	EPM	0.33	0.28	0.41	0.23	0.31
SODIUM	EPM	4.78	3.48	4.57	3.87	3.87
CALCIUM	EPM	5.99	3.64	5.64	6.14	4.94
MAGNESIUM	EPM	6.91	8.88	9.38	8.97	10.04
SULFATE	EPM	7.99	7.41	10.37	10.01	10.16
CHLORIDE	EPM	0.31	0.23	0.23	0.31	0.28
CARBONATE	EPM	1.60	1.50	0.00	1.60	0.00
BICARBONATE	EPM	7.60	7.10	9.60	7.80	9.19
FLOURIDE	EPM	0.03	0.03			
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		18.02	16.29	19.99	19.21	19.15
TOTAL ANIONS		17.46	16.21	72.73	72.23	72.15
DEVIATION		96.93	99.51	364	376	377
TDS (calc.)		998	894	1140	1104	1096
TDS @180		1016	939	1200	1090	1031
TOTAL HARDNESS		644	624	750	755	750
ALKALINITY		460	430	480	470	460
NON-CARB HARD		184	194	270	285	290
LAB CONDUCTIVITY		1363	1366	1500	1500	1460
FIELD COND.		1300				
LAB pH		8.60	8.40	7.80	8.30	8.20
FIELD pH		8.45	8.40			

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

MUDDY CREEK 6 of 7

DATE		050879	071979	082279	091879
POTASSIUM	PPM	8.00	11.00	17.00	13.00
SODIUM	PPM	79.00	92.00	104	97.00
CALCIUM	PPM	93.00	87.00	99.00	131
MAGNESIUM	PPM	115	120	119	102
SULFATE	PPM	489	500	493	494
CHLORIDE	PPM	10.00	12.00	10.00	10.00
CARBONATE	PPM	0.00	48.00	0.00	0.00
BICARBONATE	PPM	476	415	549	573
FLOURIDE	PPM				
SILICON DIO	PPM				
TOTAL P	PPM	0.61	0.01	0.01	0.01
NITRATE	PPM	0.10	0.50	0.52	0.20
POTASSIUM	EPM	0.20	0.28	0.43	0.33
SODIUM	EPM	3.44	4.00	4.52	4.22
CALCIUM	EPM	4.64	4.34	4.94	6.54
MAGNESIUM	EPM	9.46	9.87	9.79	8.39
SULFATE	EPM	10.18	10.41	10.26	10.29
CHLORIDE	EPM	0.28	0.34	0.28	0.28
CARBONATE	EPM	0.00	1.60	0.00	0.00
BICARBONATE	EPM	7.80	6.80	9.00	9.39
FLOURIDE	EPM				
NITRATE	EPM	0.01	0.00	0.00	0.00
TOTAL CATIONS		17.74	18.50	19.69	19.48
TOTAL ANIONS		70.79	71.65	72.06	72.47
DEVIATION		399	387	366	372
TDS (calc.)		1030	1070	1110	1130
TDS @180		1070	1090	1070	1140
TOTAL HARDNESS		706	710	735	746
ALKALINITY		390	420	450	470
NON-CARB HARD		316	290	285	276
LAB CONDUCTIVITY		1330	1700	1460	1500
FIELD COND.		940		1190	1420
LAB pH		8.10	8.40	8.00	8.00
FIELD pH					

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

MUDDY CREEK 7 of 7

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	10.69	6.90	29.00
SODIUM	PPM	86.62	191	29.00
CALCIUM	PPM	122	3019	29.00
MAGNESIUM	PPM	87.86	941	29.00
SULFATE	PPM	401	3823	29.00
CHLORIDE	PPM	8.66	10.64	29.00
CARBONATE	PPM	28.79	753	29.00
BICARBONATE	PPM	490	4934	29.00
FLOURIDE	PPM	0.62	0.02	22.00
SILICON DIO	PPM	12.77	9.27	22.00
TOTAL P	PPM	0.06	0.02	29.00
NITRATE	PPM	0.19	0.77	29.00
POTASSIUM	EPM	0.27		
SODIUM	EPM	3.77		
CALCIUM	EPM	6.10		
MAGNESIUM	EPM	7.23		
SULFATE	EPM	8.34		
CHLORIDE	EPM	0.24		
CARBONATE	EPM	0.96		
BICARBONATE	EPM	8.02		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		17.37	3.12	29.00
TOTAL ANIONS		30.22	558	29.00
DEVIATION		167	14041	29.00
TDS (calc.)		986	13002	28.00
TDS @180		1006	10457	29.00
TOTAL HARDNESS		671	5159	29.00
ALKALINITY		449	1334	29.00
NON-CARB HARD		222	3099	29.00
LAB CONDUCTIVITY		1403	26493	29.00
FIELD COND.		1212	31369	4.00
LAB pH		8.24	0.15	29.00
FIELD pH		7.39	0.60	18.00

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

Rosebud Creek at Busby

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
10-17-77	13.9	100 meters above sewage lagoon.
10-27-77	14.6	100 meters above sewage lagoon.
10-31-77	16.3	100 meters above sewage lagoon.
10-25-78	37.5	Location 100 meters upstream from Highway 212 bridge.
04-04-79	80.3	By cable suspension from R. Small's Ranch bridge.
04-10-79	113	Cable suspension from Highway 212 bridge.

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK AT BUSBY 1 of 2

DATE		060376	040479	082279	091879
POTASSIUM	PPM	9.00	9.00	15.00	10.00
SODIUM	PPM	52.00	39.00	38.00	50.00
CALCIUM	PPM	71.00	95.00	79.00	67.00
MAGNESIUM	PPM	77.00	70.00	59.00	69.00
SULFATE	PPM	253	225	161	161
CHLORIDE	PPM	4.00	8.00	10.00	8.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	464	464	427	451
FLOURIDE	PPM	0.60			
SILICON DIO	PPM	16.00			
TOTAL P	PPM	0.15	0.08	0.01	0.02
NITRATE	PPM	1.00	0.25	0.10	0.10
POTASSIUM	EPM	0.23	0.23	0.38	0.26
SODIUM	EPM	2.26	1.70	1.65	2.18
CALCIUM	EPM	3.54	4.74	3.94	3.34
MAGNESIUM	EPM	6.33	5.76	4.85	5.68
SULFATE	EPM	5.27	4.68	3.35	3.35
CHLORIDE	EPM	0.11	0.23	0.28	0.23
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	7.60	7.60	7.00	7.39
FLOURIDE	EPM	0.03			
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		12.37	12.43	10.83	11.45
TOTAL ANIONS		12.99	65.04	63.15	63.50
DEVIATION		105	523	583	555
TDS (calc.)		694	674	572	587
TDS @180		770	626	609	606
TOTAL HARDNESS		495	525	442	451
ALKALINITY		380	380	350	370
NON-CARB HARD		115	145	92.00	81.00
LAB CONDUCTIVITY		1000	950	860	900
FIELD COND.				820	850
LAB pH		7.50	8.20	8.00	7.70
FIELD pH		7.50			

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
9-1/8"
1/2"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK AT BUSBY 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	10.75	6.19	4.00
SODIUM	PPM	44.75	39.69	4.00
CALCIUM	PPM	78.00	115	4.00
MAGNESIUM	PPM	68.75	41.19	4.00
SULFATE	PPM	200	1619	4.00
CHLORIDE	PPM	7.50	4.75	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	451	228	4.00
FLOURIDE	PPM	0.60	0.00	1.00
SILICON DIO	PPM	16.00	0.00	1.00
TOTAL P	PPM	0.06	0.00	4.00
NITRATE	PPM	0.26	0.20	4.00
POTASSIUM	EPM	0.27		
SODIUM	EPM	1.95		
CALCIUM	EPM	3.89		
MAGNESIUM	EPM	5.66		
SULFATE	EPM	4.16		
CHLORIDE	EPM	0.21		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	7.40		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		11.77	0.44	4.00
TOTAL ANIONS		51.17	486	4.00
DEVIATION		442	38184	4.00
TDS (calc.)		632	2808	4.00
TDS @180		653	4641	4.00
TOTAL HARDNESS		478	1131	4.00
ALKALINITY		370	150	4.00
NON-CARB HARD		108	601	4.00
LAB CONDUCTIVITY		927	2769	4.00
FIELD COND.		835	225	2.00
LAB pH		7.85	0.07	4.00
FIELD pH		7.50	0.00	1.00

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Davis Creek above Parker's Ranch

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
07-09-76	0.86	First eight measurements were above the Parker Ranch, on the Northern Cheyenne Reservation boundary. Pigmy meter and float techniques were used.
08-16-76	0.67	
09-16-76	0.43	
10-29-76	0.49	
03-22-77	1.3	
04-27-77	2.1	
05-25-77	0.66	
10-26-77	0.39	
10-25-78	1.23	Location at Highway 314 bridge
04-04-79	7.63	same

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

DAVIS CREEK 1 of 2

DATE		070976	021777	042777
POTASSIUM	PPM	8.00	8.00	12.00
SODIUM	PPM	119	80.00	100.00
CALCIUM	PPM	69.00	166	122
MAGNESIUM	PPM	107	58.00	81.00
SULFATE	PPM	422	376	365
CHLORIDE	PPM	9.00	13.00	10.00
CARBONATE	PPM	84.00	0.00	42.00
BICARBONATE	PPM	378	537	500
FLOURIDE	PPM	0.30	0.30	0.29
SILICON DIO	PPM	7.00	14.00	5.00
TOTAL P	PPM	0.17	0.11	0.11
NITRATE	PPM	1.00	1.00	0.10
POTASSIUM	EPM	0.20	0.20	0.31
SODIUM	EPM	5.18	3.48	4.35
CALCIUM	EPM	3.44	8.28	6.09
MAGNESIUM	EPM	8.80	4.77	6.66
SULFATE	EPM	8.79	7.83	7.60
CHLORIDE	EPM	0.25	0.37	0.28
CARBONATE	EPM	2.80	0.00	1.40
BICARBONATE	EPM	6.20	8.80	8.19
FLOURIDE	EPM	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		17.63	16.74	17.41
TOTAL ANIONS		17.99	16.92	17.42
DEVIATION		102	101	100
TDS (calc.)		1004	965	978
TDS @180		1023	967	904
TOTAL HARDNESS		609	651	637
ALKALINITY		450	440	480
NON-CARB HARD		159	211	157
LAB CONDUCTIVITY		1700	1320	1273
FIELD COND.				
LAB pH		8.40	7.90	8.30
FIELD pH		8.20		

8-1/2''
9-1/8''
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

DAVIS CREEK 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	9.33	3.56	3.00
SODIUM	PPM	99.67	254	3.00
CALCIUM	PPM	119	1573	3.00
MAGNESIUM	PPM	82.00	401	3.00
SULFATE	PPM	388	609	3.00
CHLORIDE	PPM	10.67	2.89	3.00
CARBONATE	PPM	42.00	1176	3.00
BICARBONATE	PPM	472	4615	3.00
FLOURIDE	PPM	0.30	0.00	3.00
SILICON DIO	PPM	8.67	14.89	3.00
TOTAL P	PPM	0.13	0.00	3.00
NITRATE	PPM	0.03	0.67	3.00
POTASSIUM	EPM	0.24		
SODIUM	EPM	4.34		
CALCIUM	EPM	5.94		
MAGNESIUM	EPM	6.75		
SULFATE	EPM	8.07		
CHLORIDE	EPM	0.30		
CARBONATE	EPM	1.40		
BICARBONATE	EPM	7.73		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		17.26	0.14	3.00
TOTAL ANIONS		17.44	0.19	3.00
DEVIATION		101	0.65	3.00
TDS (calc.)		982	263	3.00
TDS @180		965	2363	3.00
TOTAL HARDNESS		632	305	3.00
ALKALINITY		457	289	3.00
NON-CARB HARD		176	625	3.00
LAB CONDUCTIVITY		1431	36549	3.00
FIELD COND.		0.00	0.00	0.00
LAB pH		8.20	0.05	3.00
FIELD pH		8.20	0.00	1.00

9-1/2"
9-1/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

EPA-287 (Cin.)
(4-76)

Thompson Creek Above LaFever's Ranch

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
07-14-76	4-1	Location for the first twelve measurements is above LaFever's Ranch on the Northern Cheyenne Reservation boundary.
08-20-76	1.9	
09-16-76	1.7	
10-28-76	1.4	
12-01-76	1.4	
12-10-76	2.14	
01-21-77	1.6	
02-17-77	1.4	
03-17-77	1.5	
04-27-77	6.2	
05-26-77	4.3	
06-17-77	3.7	
08-25-77	0.81	One-half mile above LaFever's Ranch
10-26-77	0.54	same
10-27-78	5.10	30 feet above Highway 314 bridge
04-04-79	5.10	same

EPA-287 (Cin.)
(4-76)

THOMPSON CREEK 1 of 2

DATE		021777	021777	042777
POTASSIUM	PPM	8.00	8.00	6.00
SODIUM	PPM	31.00	31.00	20.00
CALCIUM	PPM	150	150	96.00
MAGNESIUM	PPM	42.00	42.00	40.00
SULFATE	PPM	165	165	79.00
CHLORIDE	PPM	11.00	11.00	4.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	525	525	464
FLOURIDE	PPM	0.40	0.40	0.42
SILICON DIO	PPM	24.00	24.00	25.00
TOTAL P	PPM	0.04	0.04	0.36
NITRATE	PPM	1.00	1.00	0.80
POTASSIUM	EPM	0.20	0.20	0.15
SODIUM	EPM	1.35	1.35	0.87
CALCIUM	EPM	7.48	7.48	4.79
MAGNESIUM	EPM	3.45	3.45	3.29
SULFATE	EPM	3.44	3.44	1.64
CHLORIDE	EPM	0.31	0.31	0.11
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	8.60	8.60	7.60
FLOURIDE	EPM	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.01
TOTAL CATIONS		12.49	12.49	9.10
TOTAL ANIONS		12.29	12.29	9.36
DEVIATION		98.38	98.38	103
TDS (calc.)		665	665	473
TDS @180		680	680	521
TOTAL HARDNESS		547	547	404
ALKALINITY		430	430	380
NON-CARB HARD		117	117	24.00
LAB CONDUCTIVITY		1020	1020	760
FIELD COND.				
LAB pH		7.90	7.90	7.70
FIELD pH				

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

THOMPSON CREEK 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	7.33	0.89	3.00
SODIUM	PPM	27.33	26.89	3.00
CALCIUM	PPM	132	648	3.00
MAGNESIUM	PPM	41.33	0.89	3.00
SULFATE	PPM	136	1644	3.00
CHLORIDE	PPM	8.67	10.89	3.00
CARBONATE	PPM	0.00	0.00	3.00
BICARBONATE	PPM	505	827	3.00
FLOURIDE	PPM	0.41	0.00	3.00
SILICON DIO	PPM	24.33	0.22	3.00
TOTAL P	PPM	0.15	0.02	3.00
NITRATE	PPM	0.93	0.01	3.00
POTASSIUM	EPM	0.19		
SODIUM	EPM	1.19		
CALCIUM	EPM	6.59		
MAGNESIUM	EPM	3.40		
SULFATE	EPM	2.84		
CHLORIDE	EPM	0.24		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	8.27		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		11.36	2.55	3.00
TOTAL ANIONS		11.31	1.91	3.00
DEVIATION		99.86	4.38	3.00
TDS (calc.)		601	8192	3.00
TDS @180		627	5618	3.00
TOTAL HARDNESS		499	4544	3.00
ALKALINITY		413	556	3.00
NON-CARB HARD		86.00	1922	3.00
LAB CONDUCTIVITY		933	15022	3.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.83	0.01	3.00
FIELD pH		0.00	0.00	0.00

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EPA-287 (Cin.)
(4-76)

Trail Creek Near Mouth

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
07-21-76	0.66	Location for all measurements is at the Small's Ranch road crossing, near the mouth.
09-16-76	0.57	
10-29-76	0.65	
11-24-76	0.57	
01-22-77	0.17	
02-17-77	0.16	
04-27-77	6.7	
10-26-77	0.45	
10-25-78	1.53	
04-04-79	2.71	

TRAIL CREEK 1 of 2

DATE		021777	042777	021777
POTASSIUM	PPM	10.00	5.00	8.00
SODIUM	PPM	35.00	26.00	80.00
CALCIUM	PPM	90.00	80.00	166
MAGNESIUM	PPM	52.00	51.00	58.00
SULFATE	PPM	126	144	376
CHLORIDE	PPM	10.00	3.00	13.00
CARBONATE	PPM	0.00	12.00	0.00
BICARBONATE	PPM	464	366	537
FLOURIDE	PPM	0.50	0.39	0.30
SILICON DIO	PPM	21.00	17.00	14.00
TOTAL P	PPM	0.24	0.36	0.11
NITRATE	PPM	4.00	0.30	1.00
POTASSIUM	EPM	0.26	0.13	0.20
SODIUM	EPM	1.52	1.13	3.48
CALCIUM	EPM	4.49	3.99	8.28
MAGNESIUM	EPM	4.28	4.20	4.77
SULFATE	EPM	2.62	3.00	7.83
CHLORIDE	EPM	0.28	0.08	0.37
CARBONATE	EPM	0.00	0.40	0.00
BICARBONATE	EPM	7.60	6.00	8.80
FLOURIDE	EPM	0.03	0.02	0.02
NITRATE	EPM	0.00	0.01	0.00
TOTAL CATIONS		10.55	9.45	16.74
TOTAL ANIONS		10.47	9.49	16.92
DEVIATION		99.24	100	101
TDS (calc.)		551	501	965
TDS @180		554	479	967
TOTAL HARDNESS		436	408	651
ALKALINITY		380	320	440
NON-CARB HARD		56.00	88.00	211
LAB CONDUCTIVITY		880	779	1320
FIELD COND.				
LAB pH		8.00	8.30	7.90
FIELD pH				

TRAIL CREEK 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	7.67	4.22	3.00
SODIUM	PPM	47.00	558	3.00
CALCIUM	PPM	112	1475	3.00
MAGNESIUM	PPM	53.67	9.55	3.00
SULFATE	PPM	215	12961	3.00
CHLORIDE	PPM	8.67	17.56	3.00
CARBONATE	PPM	4.00	32.00	3.00
BICARBONATE	PPM	456	4908	3.00
FLOURIDE	PPM	0.40	0.01	3.00
SILICON DIO	PPM	17.33	8.22	3.00
TOTAL P	PPM	0.24	0.01	3.00
NITRATE	PPM	1.77	2.58	3.00
POTASSIUM	EPM	0.20		
SODIUM	EPM	2.04		
CALCIUM	EPM	5.59		
MAGNESIUM	EPM	4.41		
SULFATE	EPM	4.48		
CHLORIDE	EPM	0.24		
CARBONATE	EPM	0.13		
BICARBONATE	EPM	7.47		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		12.24	10.30	3.00
TOTAL ANIONS		12.29	10.87	3.00
DEVIATION		100	0.58	3.00
TDS (calc.)		672	43244	3.00
TDS @180		667	46038	3.00
TOTAL HARDNESS		498	11784	3.00
ALKALINITY		380	2400	3.00
NON-CARB HARD		118	4464	3.00
LAB CONDUCTIVITY		993	55165	3.00
FIELD COND.		0.00	0.00	0.00
LAB pH		8.07	0.03	3.00
FIELD pH		0.00	0.00	0.00

PAGE NUMBER
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3/8"

Corral Creek at Northern Cheyenne Reservation Boundary

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
09-14-76	3.6	Location for all measurements is one-half mile up the Corral Creek Road, on the Northern Cheyenne Reservation boundary.
10-25-76	2.7	
11-24-76	2.7	
01-21-77	2.3	
02-17-77	1.9	
03-22-77	2.0	
04-27-77	21.0	
05-27-77	2.0	
06-07-77	10-9	
06-17-77	8.0	
07-13-77	4.8	
08-17-77	2.5	
10-20-77	2.2	
10-25-78	5.73	
04-04-79	6.1	

CORRAL CREEK 1 of 2

DATE		021577	042777
POTASSIUM	PPM	7.00	5.00
SODIUM	PPM	22.00	11.00
CALCIUM	PPM	80.00	67.00
MAGNESIUM	PPM	52.00	45.00
SULFATE	PPM	66.00	52.00
CHLORIDE	PPM	10.00	3.00
CARBONATE	PPM	0.00	0.00
BICARBONATE	PPM	451	415
FLOURIDE	PPM	0.60	0.47
SILICON DIO	PPM	2.00	18.00
TOTAL P	PPM	0.11	0.22
NITRATE	PPM	2.00	0.30
POTASSIUM	EPM	0.18	0.13
SODIUM	EPM	0.96	0.48
CALCIUM	EPM	3.99	3.34
MAGNESIUM	EPM	4.28	3.70
SULFATE	EPM	1.37	1.08
CHLORIDE	EPM	0.28	0.08
CARBONATE	EPM	0.00	0.00
BICARBONATE	EPM	7.39	6.80
FLOURIDE	EPM	0.03	0.02
NITRATE	EPM	0.00	0.00
TOTAL CATIONS		9.41	7.65
TOTAL ANIONS		9.01	7.98
DEVIATION		95.77	104
TDS (calc.)		459	387
TDS @180		496	382
TOTAL HARDNESS		412	350
ALKALINITY		370	340
NON-CARB HARD		42.00	10.00
LAB CONDUCTIVITY		790	618
FIELD COND.			
LAB pH		8.20	8.10
FIELD pH		8.00	

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CORRAL CREEK 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	6.00	1.00	2.00
SODIUM	PPM	16.50	30.25	2.00
CALCIUM	PPM	73.50	42.25	2.00
MAGNESIUM	PPM	48.50	12.25	2.00
SULFATE	PPM	59.00	49.00	2.00
CHLORIDE	PPM	6.50	12.25	2.00
CARBONATE	PPM	0.00	0.00	2.00
BICARBONATE	PPM	433	324	2.00
FLOURIDE	PPM	0.53	0.00	2.00
SILICON DIO	PPM	10.00	64.00	2.00
TOTAL P	PPM	0.17	0.00	2.00
NITRATE	PPM	1.15	0.72	2.00
POTASSIUM	EPM	0.15		
SODIUM	EPM	0.72		
CALCIUM	EPM	3.67		
MAGNESIUM	EPM	3.99		
SULFATE	EPM	1.23		
CHLORIDE	EPM	0.18		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	7.10		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		8.53	0.77	2.00
TOTAL ANIONS		8.49	0.27	2.00
DEVIATION		100	17.91	2.00
TDS (calc.)		423	1296	2.00
TDS @180		439	3249	2.00
TOTAL HARDNESS		381	961	2.00
ALKALINITY		355	225	2.00
NON-CARB HARD		26.00	256	2.00
LAB CONDUCTIVITY		704	7396	2.00
FIELD COND.		0.00	0.00	0.00
LAB pH		8.15	0.00	2.00
FIELD pH		8.00	0.00	1.00

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3/8"
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(4-76)

Dry Fork Creek at Kirby Road (Hwy 314)

Miscellaneous Discharge Measurements

DATE	DISCHARGE (cfs)	COMMENTS
07-14-76	0.39	All measurements were made 50 feet upstream from the Highway 314 bridge. Pigmy meter and bucket gaging techniques were used.
09-14-76	0.15	
10-27-76	0.56	
11-24-76	0.05	
04-04-79	0.27	

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ROSEBUD CREEK #2 AT SOUTHERN RESERVATION LINE -- WATER YEAR 1979

STATION DESCRIPTION

Gaging house, servo-manometer bubble gage and Leopold Stevens A-71 recorder, outside cantilever staff gage, and foot bridge. The station is located in NE 1/4 NW 1/4, Section 36, T. 5 S., R. 38 E., about one half mile north of the Reservation line on the right bank.

PERIOD OF OPERATION

June 1976 to the present year.

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 4.7 cfs, September 13,1977.
Maximum daily discharge, 433 cfs, May 19,1978.

STAGE-DISCHARGE CURVE

The stage-discharge relationship for this station has not changed during the period of record. Because of poor stage datum references prior to May 1978, only the 13 discharge measurements taken during this water year, and the measurements taken during the latter part of the 1978 water year were used to compute the stage discharge relationship. The stage discharge relationship which is concave upward and well defined between 8 and 400 cfs was approximated by two linear sections. For flows less than 26 cfs, the following relationship defined by four measurements was used:

$$\log(Q) = \log(stage)*3.91185 - .674651 \qquad r=.980.$$

For flows greater than 26 cfs, the following relationship defined by five measurements was used:

$$\log(Q) = \log(stage)*2.25932 + 1.0253 \qquad r=.999.$$

MALFUNCTIONS AND MISSING RECORDS

The manometer was not responding to stage changes from November 24 to February 7, 1979. The manometer was removed for repairs and replaced March 7, 1979.

The manometer malfunctioned during the period May 24 to June 5, 1979.

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INTERPRETATION NOTES

Ice cover was present from November 8 to March 16, 1979. Discharge during the winter was gradually decreasing, and daily discharges were estimated by linear interpolation from three discharge measurements taken during the winter. No mid-winter thaws occured.

From March 7 to March 15, water was flowing over the ice. One discharge measurement was taken during this period. Daily discharges during this period were computed by assuming that the slope of the stage discharge curve was the same as during open water flow, but adjusted downward on the basis of the one discharge measurement. Computed discharges during this period are poor.

During the period May 24 to June 5 daily discharges were computed by linear interpolation.

DATUM

The gaging station datum is the top of the casing of well NCRP 13. Between April 4 and April 20 the staff gage settled 0.20 feet.

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1979

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	22	17	16	14	14	52	96	46	25	17	8
2	20	22	17	16	14	13	53	96	45	24	18	7
3	20	20	17	15	14	13	50	92	43	22	16	7
4	20	21	17	15	14	13	49	84	42	22	14	7
5	20	21	17	15	14	13	48	83	42	22	14	7
6	20	21	17	15	14	13	47	84	41	22	13	7
7	20	20	17	15	14	13	47	87	43	22	12	7
8	20	20	17	15	14	50	53	85	46	21	12	7
9	21	20	17	15	14	60	75	81	46	20	13	7
10	21	20	17	15	14	65	91	80	44	19	12	7
11	21	20	17	15	14	64	104	78	41	18	11	8
12	21	20	16	15	14	54	122	76	39	17	11	9
13	21	20	16	15	14	50	91	76	38	16	11	10
14	20	20	16	15	14	52	78	76	36	16	12	10
15	20	19	16	15	14	45	78	74	33	16	13	10
16	21	19	16	15	14	42	85	69	32	17	13	10
17	21	19	16	15	14	40	100	69	32	18	12	10
18	21	19	16	15	14	41	133	68	32	17	12	10
19	21	19	16	15	14	43	172	64	32	16	12	10
20	22	19	16	15	14	45	193	61	32	15	11	9
21	22	19	16	15	14	47	163	60	32	15	11	10
22	22	19	16	15	14	48	130	59	31	14	10	10
23	22	18	16	15	14	44	122	58	30	15	9	10
24	22	18	16	15	14	43	121	57	29	16	9	11
25	22	18	16	14	14	48	112	55	28	15	9	11
26	22	18	16	14	14	48	107	54	27	15	10	11
27	22	18	16	14	14	49	109	53	27	18	9	12
28	23	18	16	14	14	48	111	51	29	17	10	13
29	22	18	16	14		45	105	50	29	20	12	13
30	22	17	16	14		45	100	49	27	25	11	13
31	22		16	14		48		47		20	9	
MEAN	21	19	16	15	14	41	97	70	36	18	12	9
MAX	23	22	17	16	14	65	193	96	46	25	18	13
MIN	20	17	16	14	14	13	47	47	27	14	9	7

MEAN FOR YEAR IS: 31

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ROSEBUD CREEK #2 AT SOUTHERN RESERVATION LINE -- WATER YEAR 1978

STATION DESCRIPTION

Gaging house, servo-manometer bubble gage and Leopold-Stevens A-71 recorder, outside cantilever staff gage, and foot bridge. The station is located in NE¼, Section 36, T 5 S, R 38E, about one half mile north of the Reservation line on the right bank.

PERIOD OF OPERATION

June 1976 to current year

EXTREMES FOR PERIOD OF RECORD

Minimum daily discharge, 4.7 cfs, September 13, 1977.
Maximum daily discharge, 433 cfs, May 19, 1978.

STAGE-DISCHARGE CURVE

Stage-discharge relation based on 10 discharge measurement made in Water Year 1977 and 5 made in Water Year 1978. The relation is identical to that used in Water Year 1979, and is well defined between 8 and 400 cfs.

MALFUNCTIONS AND MISSING RECORDS

The clock ran out in November which caused a deletion in the record from November 26 to January 26, 1978.

The clock ran out in July which caused a deletion in the record from July 28 to August 30, 1978.

The staff gage was lost in the May flood.

INTERPRETATION NOTES

A solid ice cover persisted from the end of Novermber until March 20, 1978. Based on two discharge measurements and the pen record, discharge gradually decreased during the winter until March 6, 1978. Daily discharge during this period were computed by linear interpretation, and extropotation from the two discharge measurements taken during this period.

Daily discharges during the period March 7 to March 19 were estimated on the basis of level changes. These estimates are poor.

During the period of July 28 to August 30, 1978 daily discharges were computed by linear interpretation.

Records during the non-ice periods are fair. During the period March till October 1978, the station was only visited twice, and only one discharge measurement (near peak flow) was made. Infrequent visits precluded more accurate records.

DATUM

The gaging station datum is the top of the casing of well NCRP 13. The staff gage settled 0.10 feet during the winter. A new staff gage was installed in October 1978, with a datum 0.50 feet higher than the previous gage.

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ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1978

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	8	10	11	9	7	6	95	55	143	51	27	9
2	10	11	11	9	7	6	90	49	145	50	26	9
3	9	11	11	9	7	6	81	45	135	48	25	9
4	8	11	11	9	7	6	78	45	116	47	25	9
5	11	11	10	9	7	6	65	52	111	47	24	9
6	9	11	10	9	7	9	57	60	106	46	24	9
7	8	11	10	9	7	9	50	71	96	45	23	9
8	10	11	10	9	7	10	47	92	92	45	23	9
9	13	11	10	9	7	12	46	160	89	44	22	9
10	12	11	10	9	7	16	43	239	87	43	21	9
11	12	11	10	9	7	16	40	146	85	43	21	9
12	11	11	10	9	7	20	40	114	83	43	20	9
13	10	11	10	8	7	30	38	113	81	43	20	34
14	10	11	10	8	7	20	35	102	79	40	19	34
15	10	11	10	8	7	20	35	88	74	39	19	46
16	10	11	10	8	7	20	37	77	72	37	18	46
17	9	11	10	8	7	20	40	79	71	38	17	33
18	9	11	10	8	7	20	43	160	70	36	17	29
19	9	11	10	8	7	20	46	433	67	35	16	21
20	9	11	10	8	6	27	41	356	64	34	16	25
21	9	11	10	8	6	29	38	313	62	33	15	31
22	9	11	10	8	6	31	38	290	65	33	15	33
23	8	11	10	8	6	33	38	253	66	33	14	33
24	8	11	9	8	6	33	37	218	61	34	13	33
25	10	11	9	8	6	35	32	189	59	34	13	30
26	9	11	9	8	6	42	29	172	55	33	12	27
27	9	11	9	8	6	47	29	150	59	29	12	25
28	9	11	9	8	6	60	35	137	58	29	11	23
29	9	11	9	8		83	48	130	53	28	11	21
30	12	11	9	8		103	61	126	52	28	10	20
31	11		9	8		97		134		27	9	
MEAN	10	11	10	8	7	29	48	150	82	38	18	22
MAX	13	11	11	9	7	103	95	433	145	51	27	46
MIN	8	10	9	8	6	6	29	45	52	27	9	9

MEAN FOR YEAR IS: 36

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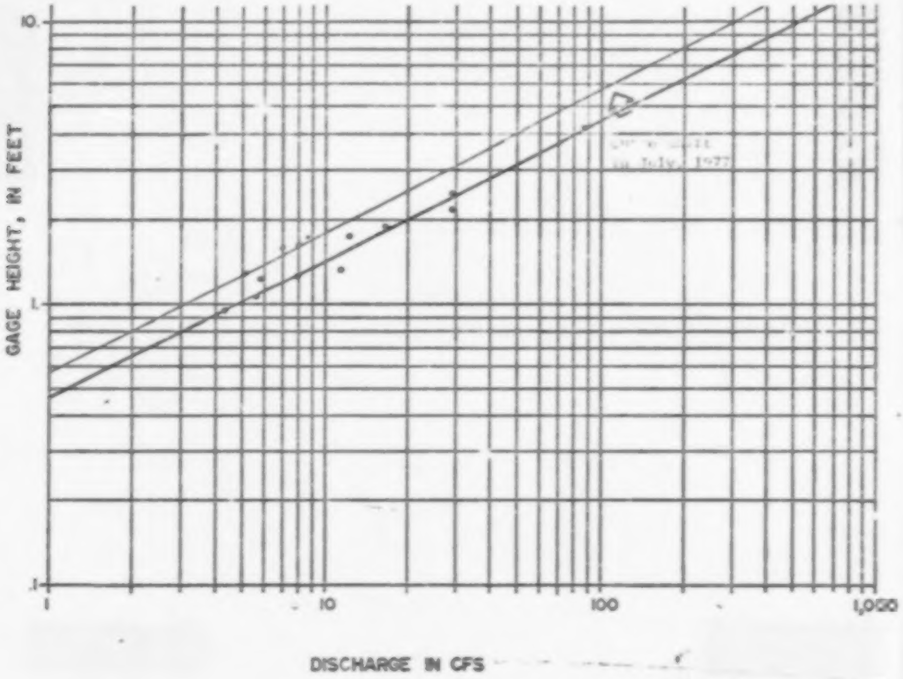
ROSEBUD CREEK #2--1977 WATER YEAR

The outside staff gage was initially installed in April,1976. Monthly current meter measurements begin in June, 1976. The servo-manometer bubble gage began recording daily gage height on June 2,1977.

The stage-discharge curve was defined by six measurements taken during the 1977 water year. The rating curve was fitted by eye and is shown in the accompanying graph. The outside gage was used as the primary reference gage but warping of the cantilever gage and poor stage datum references resulted in the need to use two stage discharge relationships, one for October to June 30, and the other for July 1 to September 30. The shift was made gradually thoughout July and August. The second curve was also used in water year 1978. This curve is identical to the curve used in water year 1979, except that the datum in 1979 is 0.49 feet higher.



Stage discharge curve for RBC #2, water year 1977-78

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3/8"
PAGE NUMBER

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1977

AVERAGE DAILY DISCHARGE (CFS)

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										17	8	5
2									28	17	8	5
3									27	16	8	5
4									26	16	8	5
5									25	17	8	5
6									24	18	8	5
7									23	18	10	5
8									23	17	10	5
9									25	16	10	5
10									30	16	8	5
11									41	14	8	5
12									39	14	8	5
13									35	13	7	5
14									39	12	6	5
15					8				40	11	7	5
16									31	11	7	5
17									29	11	7	5
18									29	10	7	5
19		8							29	9	6	5
20									26	9	6	6
21			6	6					25	8	6	6
22									24	8	5	7
23									23	8	6	7
24									21	8	6	8
25									21	8	5	8
26							86		21	11	5	7
27								31	20	13	6	7
28	6								20	16	6	7
29									18	14	6	7
30									18	11	5	8
31						16				9	6	
MEAN	6	8	6	6	8	16	86	31	27	13	7	6
MAX	6	8	6	6	8	16	86	31	41	18	10	8
MIN	6	8	6	6	8	16	86	31	18	8	5	5

MEAN FOR YEAR IS: 18

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(4-76)

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE..........	OCT 17	OCT 25	DEC 7	FEB 6	MAR 13	APR 4	APR 20	MAY 8
DISCHARGE......	22	20	17	14	50	49	198	83
GAGE HEIGHT....		2.61	3.25	3.98	4.81	3.52	6.81	4.74
ADJ. GAGE HT...		2.61	3.25	3.98	4.81	3.52	6.61	4.54
WIDTH..........	11	15	15	13	18	15	22	17
AREA...........	26	26	21	12		37	103	58
MEAN DEPTH.....	2.24	1.77	1.37	0.91		2.43	4.69	3.34
MEAN VELOCITY..	0.85	0.79	0.82	1.18		1.32	1.92	1.43
# OF SECTIONS..	23	20	20	13	6.00	26	6.00	27
CHANGE IN G.HT.		0.01	0.01		0.19			0.02
TIME...........	2.00	2.00			2.15	2.30	2.00	1.45
TEMPERATURE....	6.50	6.50		0.10	0.10	4.00		9.80
METER TYPE.....	AA	AA	PYG	PYG	PYG	AA	AA	AA
FREE OR ICE....			ICE	ICE	MIX			
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	JWM	JWM	TJO	JWM	TJO

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1979

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 5	JUL 17	AUG 21	SEP 17
DISCHARGE......	43	19	12	9.69
GAGE HEIGHT....	3.58	2.68	2.40	2.35
ADJ. GAGE HT...	3.38	2.48	2.20	2.15
WIDTH..........	13	11	10	12
AREA...........	36	23	17	18
MEAN DEPTH.....	2.83	2.07	1.66	1.50
MEAN VELOCITY..	1.18	0.80	0.62	0.53
# OF SECTIONS..	20	22	18	17
CHANGE IN G.HT.				
TIME...........	2.00	1.15	2.00	1.45
TEMPERATURE....		19		12
METER TYPE.....	AA	AA	AA	AA
FREE OR ICE....				
SUSPENSION.....	ROD	ROD	DCA	ROD
GAGED BY.......	JWM	JWM	JWM	JWM

5-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 AT KIRBY

WATER YEAR 1978

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	OCT 17	OCT 27	OCT 31	JAN 26
DISCHARGE......	8.12	7.09	8.83	7.70
GAGE HEIGHT....	1.68	1.67	1.77	2.05
ADJ. GAGE HT...				
WIDTH..........	10	10	8.60	11
AREA...........	14	12	12	13
MEAN DEPTH.....	1.30	1.20	1.38	1.13
MEAN VELOCITY..	0.59	0.58	0.74	0.59
# OF SECTIONS..	21	26	21	11
CHANGE IN G.HT.				0.06
TIME...........				
TEMPERATURE....	8.00	6.70	6.50	0.10
METER TYPE.....	AA	PYG	PYG	PYG
FREE OR ICE....				ICE
SUSPENSION.....	ROD	ROD	ROD	ROD
GAGED BY.......		TJO	TJO	TJO

6-1/2"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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TYPING GUIDE SHEET

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TOP OF IMAGE AREA

DROPPED HEAD; BEGIN SECTIONS HERE

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	NOV 19	DEC 21	JAN 21	FEB 16	MAR 30	APR 26	MAY 27	JUN 10
DISCHARGE......	7.82	6.40	6.10	8.30	16	86	31	29
GAGE HEIGHT....			2.32		1.88	4.12		2.50
ADJ. GAGE HT...								
WIDTH..........	12	10	9.00	13	11	15	13	13
AREA...........	16	12	11	15	20	58	22	22
MEAN DEPTH.....	1.33	1.25	1.23	1.12	1.84	3.89	1.68	1.78
MEAN VELOCITY..	0.49	0.51	0.55	0.57	0.81	1.48	1.41	1.30
# OF SECTIONS..	20	13	17	21	17	15	24	25
CHANGE IN G.HT.	2.00							
TIME...........								
TEMPERATURE....	1.02	0.10	0.10					
METER TYPE.....	AA	PYG	PYG	PYG	AA	AA	AA	PYG
FREE OR ICE....		ICE	ICE	ICE				
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO	TJO	TJO	TJO		

6-1/2"

9-1/8"

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

BEGIN LAST LINE OF TEXT

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EPA-287 (Cin.)
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ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1977

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUL 11	AUG 16
DISCHARGE......	12	5.16
GAGE HEIGHT....	1.76	1.32
ADJ. GAGE HT...		
WIDTH..........	10	10
AREA...........	13	9.24
MEAN DEPTH.....	1.32	0.92
MEAN VELOCITY..	0.92	0.56
# OF SECTIONS..	19	24
CHANGE IN G.HT.		
TIME...........		
TEMPERATURE....		16
METER TYPE.....	PYG	AA
FREE OR ICE....		
SUSPENSION.....	ROD	ROD
GAGED BY.......		TJO

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 NEAR KIRBY

WATER YEAR 1976

SUMMARY OF FIELD DISCHARGE MEASUREMENTS

DATE...........	JUN 23	JUL 21	AUG 16	AUG 20	SEP 18	SEP 28
DISCHARGE......	29	11	5.63	6.53	4.33	5.79
GAGE HEIGHT....	2.02	1.36			0.94	1.24
ADJ. GAGE HT...						
WIDTH..........	15	12	10	9.00	9.00	10
AREA...........	31	13		11	10	14
MEAN DEPTH.....	2.06	1.25		1.17	1.15	1.39
MEAN VELOCITY..	0.93	0.90		0.62	0.42	0.42
# OF SECTIONS..	21	23		18	17	20
CHANGE IN G.HT.						
TIME...........						
TEMPERATURE....						
METER TYPE.....	AA	PYG	PYG	PYG	PYG	PYG
FREE OR ICE....						
SUSPENSION.....	ROD	ROD	ROD	ROD	ROD	ROD
GAGED BY.......	TJO	TJO	TJO		TJO	TJO

6-1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
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ROSEBUD CREEK #2 1 of 7

DATE		121975	012976	030476	033076	050476
POTASSIUM	PPM	8.00	6.00	7.00	6.00	6.00
SODIUM	PPM	28.00	30.00	29.00	21.00	18.00
CALCIUM	PPM	80.00	76.00	86.00	80.00	80.00
MAGNESIUM	PPM	70.00	72.00	79.00	61.00	56.00
SULFATE	PPM	133	133	163	157	132
CHLORIDE	PPM	3.00	5.00	5.00	4.00	4.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	525	488	500	415	415
FLOURIDE	PPM	0.60	0.50	0.70	0.50	0.50
SILICON DIO	PPM	14.00	13.00	11.00	17.00	10.00
TOTAL P	PPM	0.03	0.07	0.02	0.10	0.10
NITRATE	PPM	0.80	0.30	1.00	1.00	1.00
POTASSIUM	EPM	0.20	0.15	0.18	0.15	0.15
SODIUM	EPM	1.22	1.31	1.26	0.91	0.78
CALCIUM	EPM	3.99	3.79	4.29	3.99	3.99
MAGNESIUM	EPM	5.76	5.92	6.50	5.02	4.61
SULFATE	EPM	2.77	2.77	3.39	3.27	2.75
CHLORIDE	EPM	0.08	0.14	0.14	0.11	0.11
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.60	8.00	8.19	6.80	6.80
FLOURIDE	EPM	0.03	0.03	0.04	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.17	11.17	12.23	10.08	9.53
TOTAL ANIONS		11.47	10.90	11.73	10.18	9.66
DEVIATION		103	97.54	95.91	101	101
TDS (calc.)		580	570	623	532	500
TDS @180		570	595	636	556	531
TOTAL HARDNESS		489	486	541	452	432
ALKALINITY		430	400	410	340	340
NON-CARB HARD		59.00	86.00	131	112	92.00
LAB CONDUCTIVITY		833	800	890	750	750
FIELD COND.						
LAB pH		8.10	8.20	7.90	8.00	7.30
FIELD pH		6.60	6.80	8.30	7.90	7.60

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
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ROSEBUD CREEK #2 2 of 7

DATE		052676	062376	072876	090276	090276
POTASSIUM	PPM	6.00	7.00	9.00	10.00	
SODIUM	PPM	22.00	25.00	29.00	40.00	
CALCIUM	PPM	74.00	53.00	62.00	68.00	
MAGNESIUM	PPM	62.00	60.00	61.00	69.00	
SULFATE	PPM	123	128	102	123	
CHLORIDE	PPM	4.00	5.00	6.00	12.00	
CARBONATE	PPM	0.00	24.00	0.00	48.00	
BICARBONATE	PPM	451	311	451	403	
FLOURIDE	PPM	0.60	0.50	0.60	0.70	
SILICON DIO	PPM	10.00	13.00	11.00	12.00	
TOTAL P	PPM	0.10	0.05	0.02	0.03	
NITRATE	PPM	1.00	1.00	1.00	1.00	
POTASSIUM	EPM	0.15	0.18	0.23	0.26	
SODIUM	EPM	0.96	1.09	1.26	1.74	
CALCIUM	EPM	3.69	2.64	3.09	3.39	
MAGNESIUM	EPM	5.10	4.94	5.02	5.68	
SULFATE	EPM	2.56	2.66	2.12	2.56	
CHLORIDE	EPM	0.11	0.14	0.17	0.34	
CARBONATE	EPM	0.00	0.80	0.00	1.60	
BICARBONATE	EPM	7.39	5.10	7.39	6.61	
FLOURIDE	EPM	0.03	0.03	0.03	0.04	
NITRATE	EPM	0.00	0.00	0.00	0.00	
TOTAL CATIONS		9.90	8.85	9.60	11.06	201
TOTAL ANIONS		10.07	8.69	9.67	11.05	160
DEVIATION		102	98.27	101	99.89	79.57
TDS (calc.)		513	455	491	568	
TDS @180		573	526	528	581	
TOTAL HARDNESS		439	376	405	455	
ALKALINITY		370	295	370	410	
NON-CARB HARD		69.00	81.00	35.00	45.00	
LAB CONDUCTIVITY		750	800	750	900	
FIELD COND.						
LAB pH		7.70	8.00	7.30	9.10	
FIELD pH		7.70		7.00	7.60	7.60

TYPING GUIDE SHEET
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CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 3 of 7

DATE		092376	102176	111776	121376	011877
POTASSIUM	PPM	9.00	9.00	8.00	8.00	6.00
SODIUM	PPM	40.00	38.00	35.00	27.00	29.00
CALCIUM	PPM	92.00	106	112	152	90.00
MAGNESIUM	PPM	61.00	48.00	52.00	22.00	61.00
SULFATE	PPM	141	126	140	115	116
CHLORIDE	PPM	10.00	10.00	8.00	8.00	7.00
CARBONATE	PPM	36.00	72.00	48.00	0.00	0.00
BICARBONATE	PPM	451	354	451	488	488
FLOURIDE	PPM	0.60	0.60	0.60	0.40	0.70
SILICON DIO	PPM	19.00	18.00	16.00	16.00	20.00
TOTAL P	PPM	0.07	0.02	0.11	0.02	0.08
NITRATE	PPM	1.00	2.00	1.00	1.00	1.00
POTASSIUM	EPM	0.23	0.23	0.20	0.20	0.15
SODIUM	EPM	1.74	1.65	1.52	1.17	1.26
CALCIUM	EPM	4.59	5.29	5.59	7.58	4.49
MAGNESIUM	EPM	5.02	3.95	4.28	1.81	5.02
SULFATE	EPM	2.94	2.62	2.91	2.39	2.42
CHLORIDE	EPM	0.28	0.28	0.23	0.23	0.20
CARBONATE	EPM	1.20	2.40	1.60	0.00	0.00
BICARBONATE	EPM	7.39	5.80	7.39	8.00	8.00
FLOURIDE	EPM	0.03	0.03	0.03	0.02	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.58	11.12	11.59	10.77	10.92
TOTAL ANIONS		11.77	11.07	12.11	10.58	10.60
DEVIATION		102	99.50	104	98.21	97.01
TDS (calc.)		611	583	625	572	549
TDS @180		604	550	605	577	489
TOTAL HARDNESS		481	462	491	468	476
ALKALINITY		430	410	450	400	400
NON-CARB HARD		51.00	52.00	41.00	68.00	76.00
LAB CONDUCTIVITY		700	960	940	860	900
FIELD COND.						
LAB pH		8.40	8.00	8.20	8.20	8.20
FIELD pH		7.30	7.30	7.90	5.70	7.70

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
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ROSEBUD CREEK #2 4 of 7

DATE		021777	032177	042577	052477	061577
POTASSIUM	PPM	7.00	7.00	5.00	6.00	6.00
SODIUM	PPM	30.00	26.00	12.00	18.00	18.00
CALCIUM	PPM	86.00	98.00	65.00	79.00	85.00
MAGNESIUM	PPM	60.00	57.00	41.00	56.00	50.00
SULFATE	PPM	135	137	104	107	117
CHLORIDE	PPM	10.00	5.00	3.00	10.00	6.00
CARBONATE	PPM	0.00	24.00	0.00	48.00	18.00
BICARBONATE	PPM	451	427	311	342	378
FLOURIDE	PPM	0.60	0.60	0.37	0.49	0.49
SILICON DIO	PPM	16.00	14.00	12.00	15.00	17.00
TOTAL P	PPM	0.20	0.02	0.05	0.04	0.07
NITRATE	PPM	1.00	0.10	0.80	0.50	0.60
POTASSIUM	EPM	0.18	0.18	0.13	0.15	0.15
SODIUM	EPM	1.31	1.13	0.52	0.78	0.78
CALCIUM	EPM	4.29	4.89	3.24	3.94	4.24
MAGNESIUM	EPM	4.94	4.69	3.37	4.61	4.11
SULFATE	EPM	2.81	2.85	2.17	2.23	2.44
CHLORIDE	EPM	0.28	0.14	0.08	0.28	0.17
CARBONATE	EPM	0.00	0.80	0.00	1.60	0.60
BICARBONATE	EPM	7.39	7.00	5.10	5.61	6.20
FLOURIDE	EPM	0.03	0.03	0.02	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		10.71	10.89	7.27	9.49	9.29
TOTAL ANIONS		10.45	10.79	7.35	9.67	9.38
DEVIATION		97.52	99.06	101	102	101
TDS (calc.)		550	564	383	492	486
TDS @180		566	579	419	527	523
TOTAL HARDNESS		461	479	331	425	415
ALKALINITY		370	390	255	360	340
NON-CARB HARD		91.00	89.00	76.00	65.00	75.00
LAB CONDUCTIVITY		880	990	646	804	786
FIELD COND.						
LAB pH		8.20	8.30	8.10	8.50	8.30
FIELD pH		8.20	8.30	8.10		

1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 5 of 7

DATE		072877	100677	102777	020679	031379
POTASSIUM	PPM	7.00	13.00	8.00	7.00	8.00
SODIUM	PPM	24.00	40.00	40.00	29.00	25.00
CALCIUM	PPM	51.00	80.00	76.00	89.00	73.00
MAGNESIUM	PPM	59.00	62.00	66.00	69.00	67.00
SULFATE	PPM	107	121	125	160	147
CHLORIDE	PPM	6.00	8.00	8.00	11.00	10.00
CARBONATE	PPM	24.00	12.00	12.00	0.00	0.00
BICARBONATE	PPM	317	488	500	500	427
FLOURIDE	PPM	0.45	0.56	0.66		
SILICON DIO	PPM	16.00	18.00	16.00		
TOTAL P	PPM	0.04	0.01	0.06	0.14	0.08
NITRATE	PPM	0.30	0.40	0.10	0.51	0.36
POTASSIUM	EPM	0.18	0.33	0.20	0.18	0.20
SODIUM	EPM	1.04	1.74	1.74	1.26	1.09
CALCIUM	EPM	2.54	3.99	3.79	4.44	3.64
MAGNESIUM	EPM	4.85	5.10	5.43	5.68	5.51
SULFATE	EPM	2.23	2.52	2.60	3.33	3.06
CHLORIDE	EPM	0.17	0.23	0.23	0.31	0.28
CARBONATE	EPM	0.80	0.40	0.40	0.00	0.00
BICARBONATE	EPM	5.20	8.00	8.19	8.19	7.00
FLOURIDE	EPM	0.02	0.03	0.03		
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		8.62	11.16	11.17	11.56	10.45
TOTAL ANIONS		8.37	11.11	11.40	64.34	62.86
DEVIATION		97.12	99.54	102	557	602
TDS (calc.)		434	576	581	611	540
TDS @180		482	634	590	630	519
TOTAL HARDNESS		371	452	462	505	456
ALKALINITY		300	420	430	410	350
NON-CARB HARD		71.00	32.00	32.00	95.00	106
LAB CONDUCTIVITY		812	911	921	900	790
FIELD COND.			540			449
LAB pH		8.50	8.20	8.30	7.80	8.00
FIELD pH		8.30	8.26			

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
1/2"
9-1/8"
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

ROSEBUD CREEK #2 6 of 7

DATE		040479	050879	082279	091879
POTASSIUM	PPM	7.00	5.00	8.00	9.00
SODIUM	PPM	22.00	19.00	29.00	43.00
CALCIUM	PPM	77.00	79.00	71.00	57.00
MAGNESIUM	PPM	65.00	61.00	68.00	80.00
SULFATE	PPM	174	125	150	145
CHLORIDE	PPM	7.00	7.00	8.00	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	415	403	427	488
FLOURIDE	PPM				
SILICON DIO	PPM				
TOTAL P	PPM	0.05	0.57	0.01	0.01
NITRATE	PPM	0.28	0.10	0.10	0.10
POTASSIUM	EPM	0.18	0.13	0.20	0.23
SODIUM	EPM	0.96	0.83	1.26	1.87
CALCIUM	EPM	3.84	3.94	3.54	2.84
MAGNESIUM	EPM	5.35	5.02	5.59	6.58
SULFATE	EPM	3.62	2.60	3.12	3.02
CHLORIDE	EPM	0.20	0.20	0.23	0.17
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	6.80	6.61	7.00	8.00
FLOURIDE	EPM				
NITRATE	EPM	0.00	0.01	0.00	0.00
TOTAL CATIONS		10.33	9.91	10.60	11.53
TOTAL ANIONS		63.16	61.95	62.88	63.73
DEVIATION		612	625	593	553
TDS (calc.)		556	494	544	580
TDS @180		520	536	590	612
TOTAL HARDNESS		461	446	456	470
ALKALINITY		340	330	350	400
NON-CARB HARD		121	116	106	70.00
LAB CONDUCTIVITY		830	800	870	900
FIELD COND.		470		800	820
LAB pH		8.10	8.20	8.00	8.00
FIELD pH				7.90	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

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ROSEBUD CREEK #2 7 of 7

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	7.43	2.74	28.00
SODIUM	PPM	28.07	62.85	28.00
CALCIUM	PPM	81.32	378	28.00
MAGNESIUM	PPM	60.54	125	28.00
SULFATE	PPM	132	327	28.00
CHLORIDE	PPM	7.00	6.07	28.00
CARBONATE	PPM	13.07	391	28.00
BICARBONATE	PPM	431	3650	28.00
FLOURIDE	PPM	0.56	0.01	22.00
SILICON DIO	PPM	14.73	8.20	22.00
TOTAL P	PPM	0.05	0.01	28.00
NITRATE	PPM	0.03	0.67	28.00
POTASSIUM	EPM	0.19		
SODIUM	EPM	1.22		
CALCIUM	EPM	4.06		
MAGNESIUM	EPM	4.98		
SULFATE	EPM	2.74		
CHLORIDE	EPM	0.20		
CARBONATE	EPM	0.44		
BICARBONATE	EPM	7.06		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		17.02	1210	29.00
TOTAL ANIONS		26.45	1091	29.00
DEVIATION		201	39739	29.00
TDS (calc.)		542	3255	28.00
TDS @180		559	2416	28.00
TOTAL HARDNESS		452	1778	28.00
ALKALINITY		375	2116	28.00
NON-CARB HARD		76.54	729	28.00
LAB CONDUCTIVITY		837	6430	28.00
FIELD COND.		616	26091	5.00
LAB pH		8.11	0.12	28.00
FIELD pH		7.60	0.43	20.00

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APPENDIX B

GROUNDWATER DATA

EXPLANATORY NOTES

The groundwater data Appendix is organized by well, with the wells arranged by region (refer to Table of Contents). A summary of all monitoring wells on the Reservation, including information on well location, completion, aquifer, etc., preceeds the well data tabulations. There is also a summary of water quality data arranged by aquifer.

The data for each well, when data are available, are presented in the following order:

--stratigraphic log

--water level data

--plot of water level data

--water quality data

SUMMARY INFORMATION ON MONITORING WELLS 1 of 4

WELL		LOCATION	OWNER	ELEVATION FT.	DRILLING COMPLETED	DIAMETER
NCRP 1A	SENWSE	Sec28T4SR39E	TRIBE	4060	11-08-75	.49
NCRP 1B	SENWSE	Sec28T4SR39E	TRIBE	4960	11-13-75	.56
NCRP 2A	SWNWSE	Sec21T5SR39E	TRIBE	4580	11-13-75	.56
NCRP 2B	SENWSE	Sec21T5SR39E	TRIBE	4580	11-15-75	.56
NCRP 4	SWSWSE	Sec22T4SR41E	TRIBE	4385	05-16-76	.56
NCRP 5	NENWNE	Sec3T4SR42E	TRIBE	4195	05-27-76	.56
NCRP 8A	SWSWSE	Sec13T3SR43E	TRIBE	3180	03-19-76	.56
NCRP 9A	SENWNE	Sec28t3SR44E	TRIBE	2960	03-25-76	.56
NCRP 9B	SENWNE	Sec28T3SR44E	TRIBE	2960	03-25-76	.56
NCRP 10A	SENWNW	Sec22T2SR44E	TRIBE	2880	04-08-76	.50
NCRP 10B	SENWNW	Sec22T2SR44E	TRIBE	2880	04-08-76	.56
NCRP 11A	SENENW	Sec36T2SR42E	TRIBE	3302	12-02-75	.56
NCRP 11B	SENENW	Sec36T2SR42E	TRIBE	3302	12-10-75	.56
NCRP 12A	SENWNW	Sec25T5SR42E	TRIBE	3152	12-04-75	.56
NCRP 12B	SENWNW	Sec25T5SR42E	TRIBE	3152	12-06-75	.56
NCRP 13A	NENESW	Sec36T6SR38E	TRIBE	3780	04-15-76	.50
NCRP 13B	NENESW	Sec36T6SR38E	Bixby	3780	05-28-74	.50
NCRP 14C	SESWNW	Sec22T4SR41E	TRIBE	4200	09-27-76	.25
NCRP 15A	NWSESW	Sec8T2SR40E	TRIBE	3775	04-16-76	.50
NCRP 15B	NWSESW	Sec8T2SR40E	TRIBE	3775	04-18-76	.50
NCRP 16A	SESWNE	Sec13T4SR43E	TRIBE	2999		.50
NCRP 16B	SESWNE	Sec13T4SR43E	TRIBE	2999	12-12-75	.56
NCRP 17A	SWSWNE	Sec13T2SR38E	TRIBE	3975	10-20-75	.67
NCRP 17B	SWSWNE	Sec13T2SR38E	TRIBE	3975	10-20-75	.67
NCRP 18	SENWSE	Sec25T2SR39E	TRIBE	3451	04-01-76	.56
NCRP 19	NENESE	Sec14T2SR41E	TRIBE	4090	07-09-76	.56
NCRP 20A	NENENW	Sec18T3SR39E	TRIBE	3342	11-26-75	.56
NCRP 20B	NENENW	Sec18T3SR39E	TRIBE	3342	12-01-75	.56
NCRP 21	NWSESW	Sec14T2SR43E	TRIBE	3210	04-07-76	.56
NCRP 22	SENWSE	Sec28T4SR41E	TRIBE	4279	05-11-76	.56
NCRP 23A	NWSESE	Sec16T4SR41E	TRIBE	4060	05-21-76	.56
NCRP 23B	NWSESE	Sec16T4SR41E	TRIBE	4060	05-21-76	.56
NCRP 24	SWSESW	Sec24T4SR41E	TRIBE	4171	05-27-76	.56
NCRP 25C	SWSENE	Sec11T4SR41E	TRIBE	4158	09-15-76	.25
NCRP 26	SENWSE	Sec14T4SR41E	TRIBE	4270	05-25-76	.56
NCRP 27	SWNWSW	Sec35T2SR43E	TRIBE	3380	07-13-76	.56
NCRP 28C	NESESE	Sec14T3SR43E	TRIBE	3200	11-05-76	.56
NCRP 29A	NENENE	Sec15T3SR43E	TRIBE	3275	07-14-76	.56
NCRP 29B	NENENE	Sec15T3SR43E	TRIBE	3275	07-15-76	.56
NCRP 30A	SWSWNW	Sec23T3SR44E	TRIBE	3080	07-21-76	.56
NCRP 31C	NESESE	Sec35T3SR43E	TRIBE	3220	10-05-76	.25
NCRP 32	SENENE	Sec1T4SR43E	TRIBE	3180	07-25-76	.52
NCRP 35A	NESESE	Sec3T2SR40E	TRIBE	3335	06-30-76	.56
NCRP 35B	NESESE	Sec3T2SR40E	TRIBE	3335	07-01-76	.56
NCRP 36A	SWSW	Sec30T2SR40E	TRIBE	3440	07-07-76	.56
NCRP 36C	SWSWSW	Sec30T2SR40E	TRIBE	3446	08-15-76	.25
NCRP 37C	SENWSES	S35T25R39E	TRIBE	3430	08-26-76	.25
NCRP 39A	NWSWNW	Sec12T3SR39E	TRIBE	3360	07-02-76	.52
NCRP 39B	NWSWNW	Sec12T3SR39E	TRIBE	3360	07-02-76	.56

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SUMMARY INFORMATION ON MONITORING WELLS 2 Of 4

		AQUIFER			CASING			
WELL	DEPTH	TYPE	INTERVAL	BLS	ALS	TYPE	PERFORATION	PACKING
NCRP 1A	200	C(Kb)	175-245	200	0.8	P	175-177	Bridged
NCRP 2B	100	C(L)	85-99	976	0.8	P	90-92	86-95
NCRP 2A	240	S/sh	205-240	239	0.57	P	232-234	225-236
NCRP 2B	158	ShC(D)	150-153	158	1.0	P	151-153	144-155
NCRP 4	392	C(Cy)	332-392	392	1.3	P	385-387	382-392
NCRP 5	118	SShCl	83-118	118	2.0	P	111-113	102-118
NCRP 8A	200	C(Kb)	140-200	198	1.7	P	194-197	186-198
NCRP 8B	30	SG	12-30	30	0.6	P	26-28	25-30
NCRP 9A	101	C(L)	97-101	101	1.8	P	97-100	92-101
NCRP 9B	54	C(L)	48-53	54	1.5	P	50-53	45-54
NCRP 10A	94	Ss		94	1.95	P	91-93	
NCRP 10B	20	G	5-20	20	1.45	P	17-19	
NCRP 11A	265	C(Kb)	250-265	265	1.7	P	259-261	253-262
NCRP 11B	49	C(L)	39-45	49	1.5	P	42-44	35-46
NCRP 12A	120	SG	80-120	110	2.5	P	103-105	98-110
NCRP 12B	29	SG	20-29	29	2.3	P	21-23	16-27
NCRP 13A	77	Ss		77	0.85	Se		
NCRP 13B	41	Sg	35-40	41.3	0.80	Se		
NCRP 14c	207	C(Cy)	154-197	207	1.0	P	185-187	175-207
NCRP 15A	96	Ss		96	2.8	P	93-95	
NCRP 15B	17	SG	8-17	16.7	1.2	P		
NCRP 16A	187	St			1.35	Se		
NCRP 16B	30	SG	20-30	28	1.8	P	22-25	18-30
NCRP 17A	280	Ss	156-164	158	1.7	P	156-158	153-161
NCRP 17B	280	Ss	76-94	85	1.0	P	83-85	80-87
NCRP 18	129	C(L)	121-127	129	1.5	P	125-128	120-128
NCRP 19	220	Cl	0-78	68	2.0	Se	cave in	
NCRP 20A	108	C(L)	100-103	108	1.7	P	101-103	96-195
NCRP 20B	81	C(L)	74-81	81	1.9	P	75-77	70-78
NCRP 21	118	C(Kb)	91-117	118	2.1	P	114-117	109-118
NCRP 22	272	C(Cy)	226-267	272	1.4	P	226-267	220-272
NCRP 23A	210	Ss	201-205	210	1.9	P	203-205	200-210
NCRP 23B	62	C(L)	52-60	62	1.1	P	58-60	52-62
NCRP 24	220	Ss	197-208	220	1.3	P	208-210	200-220
NCRP 25c	217	Ss	182-191	217	0.8	P	185-187	176-217
NCRP 26	220	C(cy)	190-219	220	1.2	P	217-219	210-220
NCRP 27	283	C(Kb)	197-276	283	2.0	P	271-273	265-283
NCRP 28c	194	C(Kb)	168-186	192	1.0	P	178-180	172-192
NCRP 29A	260	C(Kb)	178-252	260	2.0	P	247-249	242-260
NCRP 29B	60	G	30-51	52	2.3	P	45-50	47-52
NCRP 30A	124	C(Kb)	91-118	124	1.8	P	114-116	111-124
NCRP 31c	176	C(Kb)	114-159	176	1.0	P	151-153	143-176
NCRP 32	146	C-KSS	132-140	146	2.2	P	136-140	133-146
NCRP 35A	297	C(Rb)	278-293	297	2.3	P	285-287	279-297
NCRP 35B	70	Ss	61-70	70	2.5	P	68-70	52-70
NCRP 36A	122	C-SS	109-120	122	2.1	P	97-104	104-122
NCRP 36C	119	C-LSH	109-119	119	2.2	P	109-117	102-119
NCRP 37C	100	C(L)	835-87	101	1.4	P	84-86	80-101

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SUMMARY INFORMATION ON MONITORING WELLS

WELL	LOCATION		OWNER	ELEVATION FT.	DRILLING COMPLETED	DIAMETER
NCRP 40A	SENENW	Sec4T3SR39E	TRIBE	3560	07-06-76	.56
NCRP 40B	SENENW	Sec4T3SR39E	TRIBE	3560	07-06-76	.56
RBCW 2	NWSW	Sec1RSSR38E	SMALL	3691	03-09-73	.5
RBCW 3	SWSWNS	Sec26T4SR38E	LAFEVER	3600	06-05-76	
RBCW 4	SWSWSW	Sec36T3SR38E	RUSSELL	3500	03-09-72	.5
RBCW 7	NWNESW	Sec28T3SR39E	GLENMORE	3394	08-07-73	.5
RBCW 8	NENENW	Sec18T3SR40E	KILLSNIGHT	3320	09-08-73	.5
RBCW 9	NENWNE	Sec24T2SR40E	REDNECK	3240	07-14-73	.5
RBCW 10	SESWSW	Sec18T2SR41E	MEDICINE ELK	3189	05-21-67	.5
LDCW 1	NENWNW	Sec34T3SR42E	SPANG	3980	11-12-71	.5
LDCW 2	SWSENE	Sec13T3SR41E	CHARETTE	3640	11-20-73	.5
LDCW 3	SWNENE	Sec3T3SR41E	STEVENS	3402	12-03-73	.5
LDCW 4	NWSWNE	Sec 1T3SR41E	SIMPSON	3556	09-05-73	.5
LDCW 5	NENWNW	Sec28T2SR41E	KELLUM	3300	07-11-73	.5
LDCW 6	SESESE	Sec17T2SR41E	KINZEL	3215	02-22-73	.5
LDCW 7	NENESE	Sec30T2SR42E	POND	3740	10-29-74	.5
LDCW 8	NWSENE	Sec34T2SR41E	MCMAKIN	3380	05-31-75	.5
USGS 1	SESENE	Sec 9T3SR44E	TRIBE	2955	73	.15
USGS 3	SWSENE	Sec19T2SR41E	TRIBE	3170	73	.15
USGS 4	NWSWNE	Sec31T2SR41E	TRIBE	3310	73	.5
MCW 1	NWSENE	Sec 5T4SR40E	ROWLAND	3690	11-10-71	.5
MCW 2	NENWSE	Sec 6T4SR41E	R. HARRIS	3640	11-17-71	.5
MCW 3	SWNESE	Sec26T3SR40E	L. HARRIS	3460	07-24-73	.5
MCW 4	SESESW	Sec13T2SR40E	SPANG	3374	07-20-73	.5
MCW 5	SENWNW	Sec35T5SR43E	YELLOWROBE	3280	08-30-73	.38
TRW 1	NENESW	Sec 7T5SR42E	TRIBE	3130		.5
TRW 2	SWNE	Sec24T3SR44E	FISHER	3090		.5
TRW 3	SWNW	Sec28T3SR44E	BEAR	2985	09-11-73	.5
TRW 4	SWNE	Sec16T3SR44E	LITTLECOYOTE	2930	02-16-73	.5
TRW 5	SESW	Sec34T2SR44E	BRADY	2915	04-02-73	.5
TRW 6	SESW	Sec22T2SR44E	TWOTWO	2890	02-24-68	.5
TRW 7	SESWNE	Sec16T2SR44E	MEDICINE ELK	2880	70's	.5
TRW 8	SESWSE	Sec26T5SR42E	3CIRCLER	3100		.5
TRW 9	SESESE	Sec36T2SR43E	TRIBE	3302		.5
TRW 10	SENWNE	Sec33T3SR43E	WOODENLEGS	3580		.5

SUMMARY INFORMATION ON MONITORING WELLS

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		AQUIFER			CASING			
WELL	DEPTH	TYPE	INTERVAL	BLS	ALS	TYPE	PERFORATION	PACKING
NCRP 39A	110	Ss	99-110	110	2.6	P	106-108	99-110
NCRP 39B	64	SG	53-64	64	2.1	P	59-61	None
NCRP 40A	160	C(L)	153-160	160	2.0	p	156-158	150-160
NCRP 40B	31	C(R)	26-30	31	2.5	P	28-30	25-31
RBCW 2	80	Ss	62-80	63	1.3	Se		
RBCW 3	66	S-G	44-66	66	1.66	P		
RBCW 4	103	Ss	35-103	103	1.0	Se	60-102	
RBCW 7	59	SG	47-53	57	1.55	S	41-53	
RBCW 8	102	Ss	78-95	42-100	1.66	P	82-102	
RBCW 9	75	SS	69-73	72	1.5	p	68-72	
RBCW 10	63	G	18-63	62			55-63	
LDCW 1	77	Ss	62-77	77	.95		69-77	
LDCW 2	117	Ss	60-117	0-117	1.90	P	97-117	
LDCW 3	220	C()Sh	174-220	0-220	1.45	P	190-220	
LDCW 4	72	C()Sh	38-72	0-72	2.20	P	43-46	
LDCW 5	175	Ss	172-175	0-175	1.30		135-175	
LDCW 6	60	C/G	24-60	42	.37	Se		
LDCW 7	120	Ss	80-120	120	1.30	P	85-120	
LDCW 8	98	Sh	91-98	98	1	Se	91-98	
USGS 1	102	S-G	60-102	100	295	Se		
USGS 3	42			42	2.40	Se		
USGS 4	77			77	0.25	Se		
MCW 1	95	Cl	45-55	55	.27	S	45-55	
MCW 2	200	Ss	130-200		1.3		180-200	
MCW 3	57	SG	54-57	57	1.2		52-56	
MCW 4	91	SS	80-91		1.5		80-91	
MCW 5	42	SG	20-42	42	1.5		36-41	
TRW 1	71				2.5	P		
TRW 2	220				2.70	P		
TRW 3	80	Ss	75-80		2.0		70-80	
TRW 4	63	G		63	1.73	Se		
TRW 5	160	Ss	98-169	105	1.7	Se		
TRW 6	68	S	66-68	68	1.8	Se		
TRW 7	53	SG	45-53	53	0.9	Se	48-52	
TRW 8	17.9			17.9	2.1	Se		
TRW 9	259	C(Kb)			4.2	Se		
TRW 10	172	Ss						

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WATER QUALITY SUMMARY   UNCONSOLIDATED AQUIFER

MEAN CONCENTRATIONS

DATE		TRW7	NCR12A	NCR12B	NCR10B	NCR16B
POTASSIUM	PPM	6.50	13.44	23.75	7.20	13.71
SODIUM	PPM	528	210	427	115	243
CALCIUM	PPM	77.50	57.22	83.25	30.40	62.86
MAGNESIUM	PPM	44.50	36.11	73.75	37.80	39.00
SULFATE	PPM	1136	498	971	173	362
CHLORIDE	PPM	15.50	9.44	12.12	9.00	9.57
CARBONATE	PPM	0.00	7.22	15.75	7.20	88.29
BICARBONATE	PPM	427	278	461	341	562
FLOURIDE	PPM	1.03	1.98	1.34	1.38	0.96
SILICON DIO	PPM	7.50	23.11	18.25	11.00	21.00
TOTAL P	PPM	0.08	0.41	0.05	0.08	0.09
NITRATE	PPM	0.55	1.22	0.76	0.74	0.27
POTASSIUM	EPM	0.17	0.34	0.61	0.18	0.35
SODIUM	EPM	22.97	9.15	18.57	4.99	10.56
CALCIUM	EPM	3.87	2.86	4.15	1.52	3.14
MAGNESIUM	EPM	3.66	2.97	6.07	3.11	3.21
SULFATE	EPM	23.66	10.37	20.21	3.61	7.54
CHLORIDE	EPM	0.44	0.27	0.34	0.25	0.27
CARBONATE	EPM	0.00	0.24	0.52	0.24	2.94
BICARBONATE	EPM	7.00	4.56	7.56	5.58	9.22
FLOURIDE	EPM	0.05	0.10	0.07	0.07	0.05
NITRATE	EPM	0.00	0.01	0.00	0.00	0.00
TOTAL CATIONS		30.66	15.32	29.40	9.80	17.26
TOTAL ANIONS		31.04	15.47	28.62	9.69	19.95
DEVIATION		101	101	97.32	98.89	117
TDS (calc.)		2018	968	1841	547	1039
TDS @180		2157	991	1881	560	916
TOTAL HARDNESS		376	291	510	231	317
ALKALINITY		350	240	438	291	433
NON-CARB HARD		92.50	51.44	125	0.00	0.00
LAB CONDUCTIVITY		3071	1429	2917	914	1579
FIELD COND.		2200	1610	1720	660	0.00
LAB pH		8.05	8.28	8.30	8.24	7.99
FIELD pH		7.45	7.76	7.46	7.20	7.20

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WATER QUALITY SUMMARY UNCONSOLIDATED AQUIFER

MEAN CONCENTRATIONS

DATE		NCRP8B	NCR29B	NCR13B	NCR15B	NCR35B
POTASSIUM	PPM	11.17	15.75	12.29	29.67	14.67
SODIUM	PPM	308	118	60.14	110	518
CALCIUM	PPM	108	50.00	127	128	298
MAGNESIUM	PPM	86.67	32.75	53.57	66.83	152
SULFATE	PPM	742	264	185	345	1969
CHLORIDE	PPM	14.17	12.50	9.43	11.00	11.17
CARBONATE	PPM	4.00	0.00	6.86	0.00	0.00
BICARBONATE	PPM	612	287	559	613	615
FLOURIDE	PPM	1.17	0.82	0.66	0.99	0.22
SILICON DIO	PPM	27.50	34.00	24.29	26.33	11.17
TOTAL P	PPM	0.04	0.16	0.08	0.22	0.06
NITRATE	PPM	0.33	1.15	0.94	3.26	0.08
POTASSIUM	EPM	0.29	0.40	0.31	0.76	0.38
SODIUM	EPM	13.39	5.12	2.62	4.78	22.53
CALCIUM	EPM	5.38	2.49	6.33	6.39	14.89
MAGNESIUM	EPM	7.13	2.69	4.41	5.50	12.53
SULFATE	EPM	15.45	5.50	3.85	7.18	41.00
CHLORIDE	EPM	0.40	0.35	0.27	0.31	0.32
CARBONATE	EPM	0.13	0.00	0.23	0.00	0.00
BICARBONATE	EPM	10.03	4.70	9.16	10.05	10.09
FLOURIDE	EPM	0.06	0.04	0.03	0.05	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		26.19	10.71	13.67	17.43	50.32
TOTAL ANIONS		25.97	10.51	13.47	17.51	51.33
DEVIATION		99.20	97.90	98.57	100	102
TDS (calc.)		1575	634	729	992	3266
TDS @180		1604	651	745	1018	3369
TOTAL HARDNESS		625	259	537	594	1369
ALKALINITY		508	235	469	502	505
NON-CARB HARD		118	23.25	67.29	91.83	865
LAB CONDUCTIVITY		2150	1037	1110	1466	3850
FIELD COND.		1420	91676	765	990	2590
LAB pH		8.18	7.92	7.77	7.83	7.68
FIELD pH		7.24	7.43	7.18	7.37	6.90

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WATER QUALITY SUMMARY UNCONSOLIDATED AQUIFER

MEAN CONCENTRATIONS

DATE		NCR39B	LDCW6	MCW1	MCW3	MCW5
POTASSIUM	PPM	10.67	10.50	8.33	13.50	15.75
SODIUM	PPM	197	66.50	152	110	154
CALCIUM	PPM	155	105	136	172	163
MAGNESIUM	PPM	149	58.50	74.50	74.75	132
SULFATE	PPM	1218	203	426	502	660
CHLORIDE	PPM	9.67	8.33	9.50	11.50	9.75
CARBONATE	PPM	0.00	0.00	2.00	0.00	2.25
BICARBONATE	PPM	325	543	652	567	656
FLOURIDE	PPM	0.35	1.13	0.48	0.88	1.06
SILICON DIO	PPM	28.67	20.33	13.33	28.25	21.25
TOTAL P	PPM	0.04	0.03	0.09	0.12	0.10
NITRATE	PPM	0.20	0.55	0.57	0.72	0.42
POTASSIUM	EPM	0.27	0.27	0.21	0.35	0.40
SODIUM	EPM	8.56	2.89	6.60	4.78	6.70
CALCIUM	EPM	7.72	5.26	6.80	8.57	8.13
MAGNESIUM	EPM	12.26	4.81	6.13	6.15	10.83
SULFATE	EPM	25.35	4.22	8.87	10.45	13.74
CHLORIDE	EPM	0.27	0.24	0.27	0.32	0.28
CARBONATE	EPM	0.00	0.00	0.07	0.00	0.07
BICARBONATE	EPM	5.33	8.90	10.69	9.30	10.76
FLOURIDE	EPM	0.02	0.06	0.03	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		28.80	13.24	19.75	19.85	26.06
TOTAL ANIONS		30.90	13.36	19.85	20.04	24.84
DEVIATION		109	101	100	101	95.44
TDS (calc.)		1945	722	1129	1162	1527
TDS @180		2036	706	1134	1161	1572
TOTAL HARDNESS		998	502	646	735	948
ALKALINITY		267	445	538	465	542
NON-CARB HARD		732	57.50	108	270	406
LAB CONDUCTIVITY		2604	1073	1678	1593	1993
FIELD COND.		530	0.00	1190	1120	1500
LAB pH		7.87	7.77	7.93	7.70	7.84
FIELD pH		7.28	6.72	6.84	7.18	7.00

WATER QUALITY SUMMARY CONSOLIDATED AQUIFERS 1 of 5

MEAN CONCENTRATIONS

DATE		TRW 3	TRW 5	NCR16A	S.W. 2	NCR10A
POTASSIUM	PPM	10.00	12.00	7.83	3.00	4.25
SODIUM	PPM	200	165	414	335	341
CALCIUM	PPM	45.00	68.86	5.60	6.00	5.25
MAGNESIUM	PPM	26.00	45.43	2.80	2.00	3.50
SULFATE	PPM	239	240	8.00	7.00	340
CHLORIDE	PPM	6.00	8.86	15.33	9.00	9.75
CARBONATE	PPM	0.00	0.00	56.00	84.00	6.00
BICARBONATE	PPM	509	573	990	695	476
FLOURIDE	PPM	0.95	1.01	6.37	6.10	1.98
SILICON DIO	PPM	11.00	17.57	8.33	7.00	7.00
TOTAL P	PPM	0.01	0.05	0.01	0.10	0.05
NITRATE	PPM	0.55	0.03	0.67	1.00	0.50
POTASSIUM	EPM	0.26	0.31	0.20	0.08	0.11
SODIUM	EPM	8.70	7.20	18.00	14.57	14.84
CALCIUM	EPM	2.25	3.44	0.28	0.30	0.26
MAGNESIUM	EPM	2.14	3.74	0.23	0.16	0.29
SULFATE	EPM	4.99	5.01	0.17	0.15	7.08
CHLORIDE	EPM	0.17	0.25	0.43	0.25	0.28
CARBONATE	EPM	0.00	0.00	1.87	2.80	0.20
BICARBONATE	EPM	8.34	9.40	16.23	11.39	7.80
FLOURIDE	EPM	0.05	0.05	0.34	0.32	0.10
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.34	14.68	40.63	15.11	15.50
TOTAL ANIONS		13.50	14.64	18.92	14.85	15.38
DEVIATION		101	99.81	87.71	98.24	99.34
TDS (calc.)		781	824	996	788	944
TDS @180		810	830	853	815	944
TOTAL HARDNESS		220	359	21.50	24.00	27.50
ALKALINITY		417	470	905	710	400
NON-CARB HARD		0.00	0.00	150	0.00	0.00
LAB CONDUCTIVITY		1224	1275	1696	1550	1603
FIELD COND.		0.00	900	1250	0.00	9.00
LAB pH		7.65	7.70	8.15	8.90	8.17
FIELD pH		7.26	7.10	7.67	8.20	7.75

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PAGE NUMBER
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(4-76)

WATER QUALITY SUMMARY CONSOLIDATED AQUIFERS 2 of 5

MEAN CONCENTRATIONS

DATE		NCR13A	RBCW 2	S.W. 1	RBCW 4	RBCW 6
POTASSIUM	PPM	9.60	11.44	0.00	2.70	9.50
SODIUM	PPM	41.20	65.33	0.00	24.50	125
CALCIUM	PPM	14.00	115	0.00	53.20	87.00
MAGNESIUM	PPM	53.00	62.00	0.00	30.20	74.00
SULFATE	PPM	146	227	0.00	49.70	343
CHLORIDE	PPM	7.20	7.00	0.00	6.30	5.50
CARBONATE	PPM	44.80	0.00	0.00	0.00	0.00
BICARBONATE	PPM	146	549	0.00	305	543
FLOURIDE	PPM	0.58	0.74	0.00	0.19	0.55
SILICON DIO	PPM	0.60	24.56	0.00	11.40	13.00
TOTAL P	PPM	0.02	0.04	0.00	0.02	0.16
NITRATE	PPM	0.16	0.21	0.00	3.06	1.80
POTASSIUM	EPM	0.25	0.29	0.00	0.07	0.24
SODIUM	EPM	1.79	2.84	0.00	1.07	5.44
CALCIUM	EPM	0.70	5.76	0.00	2.65	4.34
MAGNESIUM	EPM	4.36	5.10	0.00	2.48	6.09
SULFATE	EPM	3.04	4.74	0.00	1.03	7.15
CHLORIDE	EPM	0.20	0.20	0.00	0.18	0.16
CARBONATE	EPM	1.49	0.00	0.00	0.00	0.00
BICARBONATE	EPM	2.39	9.00	0.00	5.00	8.90
FLOURIDE	EPM	0.03	0.04	0.00	0.01	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		7.10	13.99	0.00	6.27	16.11
TOTAL ANIONS		7.11	13.92	0.00	6.18	16.20
DEVIATION		100	99.50	0.00	98.46	99.86
TDS (calc.)		388	759	0.00	316	917
TDS @180		369	779	0.00	327	973
TOTAL HARDNESS		252	547	0.00	257	520
ALKALINITY		194	450	0.00	250	445
NON-CARB HARD		57.40	96.78	0.00	10.30	75.50
LAB CONDUCTIVITY		625	1137	0.00	532	1568
FIELD COND.		394	815	0.00	440	0.00
LAB pH		9.10	7.62	0.00	7.85	7.95
FIELD pH		8.05	6.91	0.00	6.89	8.00

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PAGE NUMBER
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(4-76)

WATER QUALITY SUMMARY CONSOLIDATED AQUIFERS 3 of 5

MEAN CONCENTRATIONS

DATE		NCR15A	RBCW 9	NCRP1B	NCRP2A	LDCW 1
POTASSIUM	PPM	12.75	15.75	21.88	15.00	5.64
SODIUM	PPM	214	303	129	126	23.73
CALCIUM	PPM	62.75	299	480	173	66.09
MAGNESIUM	PPM	43.75	133	3.57	3.80	24.55
SULFATE	PPM	318	1488	133	473	16.18
CHLORIDE	PPM	7.50	18.25	14.75	19.17	5.73
CARBONATE	PPM	0.00	0.00	57.12	19.33	0.00
BICARBONATE	PPM	576	540	435	86.67	366
FLOURIDE	PPM	0.73	0.43	0.50	1.40	0.80
SILICON DIO	PPM	15.25	16.75	4.12	10.33	20.27
TOTAL P	PPM	0.25	0.08	0.13	0.04	0.03
NITRATE	PPM	0.47	2.73	2.07	1.84	0.92
POTASSIUM	EPM	0.33	0.40	0.56	0.38	0.14
SODIUM	EPM	9.32	13.19	5.61	5.47	1.03
CALCIUM	EPM	3.13	14.91	23.94	8.62	3.30
MAGNESIUM	EPM	3.60	10.94	0.29	0.31	2.02
SULFATE	EPM	6.63	30.98	2.77	9.85	0.34
CHLORIDE	EPM	0.21	0.51	0.42	0.54	0.16
CARBONATE	EPM	0.00	0.00	1.90	0.64	0.00
BICARBONATE	EPM	9.45	8.85	7.13	1.42	5.99
FLOURIDE	EPM	0.04	0.02	0.03	0.07	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		16.38	39.44	40.64	28.43	6.49
TOTAL ANIONS		16.28	40.23	12.14	12.39	6.49
DEVIATION		99.41	102	39.30	74.23	99.93
TDS (calc.)		943	2522	1274	903	323
TDS @180		955	2520	1379	957	330
TOTAL HARDNESS		336	1291	1200	443	265
ALKALINITY		472	442	1254	227	300
NON-CARB HARD		0.00	848	22.37	216	0.00
LAB CONDUCTIVITY		1489	3526	3100	1877	545
FIELD COND.		940	0.00	6250	770	410
LAB pH		8.00	7.55	0.00	8.50	7.66
FIELD pH		7.50	6.50	0.00	0.00	6.76

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PAGE NUMBER

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WATER QUALITY SUMMARY CONSOLIDATED AQUIFERS 4 of 5

MEAN CONCENTRATIONS

DATE		LDCW 2	LDCW 5	LDCW 7	NCRP 5	NCRP 4
POTASSIUM	PPM	12.25	8.60	5.25	5.67	14.56
SODIUM	PPM	168	60.40	44.62	12.33	144
CALCIUM	PPM	263	105	70.50	66.00	163
MAGNESIUM	PPM	174	48.00	45.50	19.67	115
SULFATE	PPM	1144	160	73.62	12.67	675
CHLORIDE	PPM	10.25	7.80	6.75	3.67	10.44
CARBONATE	PPM	0.00	0.00	0.00	10.00	5.33
BICARBONATE	PPM	697	510	365	295	624
FLOURIDE	PPM	0.60	2.22	1.12	1.01	1.06
SILICON DIO	PPM	17.00	19.00	14.12	17.00	10.89
TOTAL P	PPM	0.03	0.03	0.03	0.07	0.06
NITRATE	PPM	0.00	0.28	0.05	1.70	0.53
POTASSIUM	EPM	0.31	0.22	0.13	0.14	0.37
SODIUM	EPM	7.30	2.63	1.94	0.54	6.27
CALCIUM	EPM	13.11	5.26	3.52	3.29	8.13
MAGNESIUM	EPM	14.29	3.95	3.74	1.62	9.49
SULFATE	EPM	23.82	3.34	1.53	0.26	14.06
CHLORIDE	EPM	0.29	0.22	0.19	0.10	0.29
CARBONATE	EPM	0.00	0.00	0.00	0.33	0.18
BICARBONATE	EPM	11.42	8.36	5.99	4.83	10.23
FLOURIDE	EPM	0.03	0.12	0.06	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		35.01	12.06	30.64	5.59	24.26
TOTAL ANIONS		35.49	11.97	24.64	5.56	24.74
DEVIATION		101	99.34	81.54	99.34	102
TDS (calc.)		2114	641	472	275	1435
TDS @180		2230	1843	477	296	1581
TOTAL HARDNESS		1369	459	363	245	881
ALKALINITY		571	418	378	258	512
NON-CARB HARD		798	40.60	2.50	0.00	369
LAB CONDUCTIVITY		2831	1046	834	522	2003
FIELD COND.		0.00	0.00	0.00	335	1360
LAB pH		7.45	7.82	7.58	7.80	7.79
FIELD pH		6.83	6.90	7.07	7.08	6.84

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WATER QUALITY SUMMARY CONSOLIDATED AQUIFERS 5 of 5

MEAN CONCENTRATIONS

DATE		NCR23A	NCR23B	MEAN	ST.DEV	#
POTASSIUM	PPM	8.13	10.57	9.38	4.94	22.00
SODIUM	PPM	140	66.57	143	115	22.00
CALCIUM	PPM	61.62	24.29	102	113	22.00
MAGNESIUM	PPM	40.37	14.29	43.84	44.64	22.00
SULFATE	PPM	130	159	290	367	22.00
CHLORIDE	PPM	14.37	6.00	9.07	4.62	22.00
CARBONATE	PPM	0.75	1.00	12.92	23.67	22.00
BICARBONATE	PPM	397	130	446	224	22.00
FLOURIDE	PPM	0.71	0.90	1.36	1.62	22.00
SILICON DIO	PPM	19.12	16.71	12.72	6.36	22.00
TOTAL P	PPM	0.11	0.11	0.06	0.06	22.00
NITRATE	PPM	1.64	0.08	0.80	1.02	22.00
POTASSIUM	EPM	0.21	0.27	0.24		
SODIUM	EPM	6.10	2.90	6.22		
CALCIUM	EPM	3.08	1.21	5.07		
MAGNESIUM	EPM	3.32	1.18	3.61		
SULFATE	EPM	2.71	3.31	6.04		
CHLORIDE	EPM	0.41	0.17	0.26		
CARBONATE	EPM	0.02	0.03	0.43		
BICARBONATE	EPM	6.51	2.14	7.31		
FLOURIDE	EPM	0.04	0.05	0.07		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		12.70	29.99	19.29	12.04	22.00
TOTAL ANIONS		9.59	24.95	15.69	9.38	22.00
DEVIATION		92.24	99.18	89.74	23.94	22.00
TDS (calc.)		509	346	840	579	22.00
TDS @180		521	349	916	631	22.00
TOTAL HARDNESS		320	120	433	394	22.00
ALKALINITY		327	109	432	260	22.00
NON-CARB HARD		1.37	11.00	123	239	22.00
LAB CONDUCTIVITY		811	563	1380	870	22.00
FIELD COND.		610	451	679	1288	22.00
LAB pH		7.98	8.26	7.25	2.33	22.00
FIELD pH		6.89	7.52	6.26	2.53	22.00

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WATER QUALITY SUMMARY COAL AQUIFERS 1 of 7

MEAN CONCENTRATIONS

DATE		NCRP2B	NCRP22	NCRP24	NCRP 4	NCRP26
POTASSIUM	PPM	15.43	10.50	13.14	13.87	85.00
SODIUM	PPM	78.43	725	105	215	453
CALCIUM	PPM	129	14.67	52.29	282	63.67
MAGNESIUM	PPM	5.00	6.50	36.00	64.37	13.00
SULFATE	PPM	292	639	106	550	73.00
CHLORIDE	PPM	13.29	13.00	5.57	9.50	17.67
CARBONATE	PPM	20.43	83.00	0.86	0.00	104
BICARBONATE	PPM	72.00	1007	490	697	1309
FLOURIDE	PPM	0.33	0.93	0.95	0.31	0.64
SILICON DIO	PPM	12.43	11.83	24.43	15.50	29.33
TOTAL P	PPM	0.44	0.13	0.19	0.15	1.67
NITRATE	PPM	1.13	0.07	1.84	0.04	0.77
POTASSIUM	EPM	0.39	0.27	0.34	0.35	2.17
SODIUM	EPM	3.41	31.54	4.55	9.35	19.72
CALCIUM	EPM	6.42	0.73	2.61	14.07	3.18
MAGNESIUM	EPM	0.41	0.53	2.96	5.30	1.07
SULFATE	EPM	6.08	13.30	2.21	11.46	1.52
CHLORIDE	EPM	0.37	0.37	0.16	0.27	0.50
CARBONATE	EPM	0.68	2.77	0.03	0.00	3.47
BICARBONATE	EPM	1.18	16.51	8.03	11.42	21.46
FLOURIDE	EPM	0.02	0.05	0.05	0.02	0.03
NITRATE	EPM	0.01	0.00	0.00	0.00	0.03
TOTAL CATIONS		22.31	57.07	10.46	29.07	26.14
TOTAL ANIONS		8.24	51.05	10.43	23.10	39.73
DEVIATION		78.05	96.69	99.86	92.78	151
TDS (calc.)		618	1988	559	1353	1406
TDS @180		699	1963	578	1400	1479
TOTAL HARDNESS		338	62.17	279	655	213
ALKALINITY		219	964	403	571	1247
NON-CARB HARD		119	0.00	0.00	85.50	0.00
LAB CONDUCTIVITY		1438	2892	915	1985	2617
FIELD COND.		754	2077	605	1420	0.00
LAB pH		8.83	8.52	7.91	7.60	7.70
FIELD pH		0.00	7.75	6.99	6.82	7.35

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WATER QUALITY SUMMARY COAL AQUIFERS 2 of 7

MEAN CONCENTRATIONS

DATE		MCW 2	LDCW 4	NCRP1A	LDCW 3	NCR11A
POTASSIUM	PPM	15.75	9.60	12.80	10.44	7.78
SODIUM	PPM	271	269	149	164	567
CALCIUM	PPM	167	240	23.60	99.11	16.33
MAGNESIUM	PPM	93.50	58.00	7.80	57.22	8.67
SULFATE	PPM	990	691	317	317	293
CHLORIDE	PPM	10.75	7.60	6.20	8.78	13.22
CARBONATE	PPM	1.50	1.20	8.40	0.00	20.00
BICARBONATE	PPM	471	571	95.00	613	1175
FLOURIDE	PPM	1.20	1.81	1.68	0.94	7.11
SILICON DIO	PPM	12.00	9.90	12.80	14.56	10.78
TOTAL P	PPM	0.05	0.04	0.32	0.04	0.17
NITRATE	PPM	3.36	0.69	1.10	4.41	0.24
POTASSIUM	EPM	0.40	0.25	0.33	0.27	0.20
SODIUM	EPM	11.78	11.71	6.47	7.15	24.67
CALCIUM	EPM	8.31	11.97	1.18	4.95	0.82
MAGNESIUM	EPM	7.69	4.77	0.64	4.71	0.71
SULFATE	EPM	20.61	14.38	6.60	6.60	6.10
CHLORIDE	EPM	0.30	0.21	0.17	0.25	0.37
CARBONATE	EPM	0.05	0.04	0.28	0.00	0.67
BICARBONATE	EPM	7.73	9.36	1.56	10.04	19.26
FLOURIDE	EPM	0.06	0.10	0.09	0.05	0.37
NITRATE	EPM	0.00	0.00	0.01	0.00	0.00
TOTAL CATIONS		28.19	28.69	8.62	17.07	26.40
TOTAL ANIONS		28.67	24.04	8.66	16.88	26.69
DEVIATION		102	95.00	101	98.97	101
TDS (calc.)		1780	1458	572	960	1507
TDS @180		1822	1491	592	956	1552
TOTAL HARDNESS		799	587	90.80	483	76.11
ALKALINITY		389	470	94.00	502	997
NON-CARB HARD		410	118	10.40	0.33	0.00
LAB CONDUCTIVITY		2410	2155	881	1394	2526
FIELD COND.		1740	1525	0.00	1250	1620
LAB pH		7.85	7.70	7.25	7.84	8.09
FIELD pH		7.00	7.20	7.42	6.93	7.81

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9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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WATER QUALITY SUMMARY COAL AQUIFERS 3 of 7

MEAN CONCENTRATIONS

DATE		NCR11B	NCRP8A	NCRP27	NCR29A	NCR21A
POTASSIUM	PPM	27.00	8.60	15.25	6.20	14.00
SODIUM	PPM	824	478	1126	462	389
CALCIUM	PPM	13.25	14.40	28.50	6.40	147
MAGNESIUM	PPM	10.50	9.60	13.50	30.40	54.17
SULFATE	PPM	852	479	1676	492	961
CHLORIDE	PPM	21.60	11.20	13.75	9.60	13.67
CARBONATE	PPM	324	14.40	51.00	43.20	6.00
BICARBONATE	PPM	426	722	982	676	540
FLOURIDE	PPM	4.58	1.82	1.37	5.34	0.53
SILICON DIO	PPM	56.40	15.20	24.00	7.60	12.50
TOTAL P	PPM	0.13	0.04	0.10	0.07	0.04
NITRATE	PPM	3.66	0.00	0.08	0.28	0.63
POTASSIUM	EPM	0.69	0.22	0.39	0.16	0.36
SODIUM	EPM	35.84	20.78	48.97	20.10	16.92
CALCIUM	EPM	0.66	0.72	1.42	0.32	7.36
MAGNESIUM	EPM	0.86	0.79	1.11	2.50	4.46
SULFATE	EPM	17.73	9.96	34.90	10.24	20.00
CHLORIDE	EPM	0.61	0.32	0.39	0.27	0.39
CARBONATE	EPM	10.80	0.48	1.70	1.44	0.20
BICARBONATE	EPM	6.98	11.84	16.09	11.08	8.85
FLOURIDE	EPM	0.24	0.10	0.07	0.28	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		64.16	22.51	51.89	23.08	29.10
TOTAL ANIONS		36.20	22.61	53.05	23.24	29.37
DEVIATION		83.93	101	102	100	101
TDS (calc.)		2255	1371	3408	1382	1851
TDS @180		2332	1356	3440	1404	1831
TOTAL HARDNESS		60.40	75.20	125	141	590
ALKALINITY		984	616	890	626	452
NON-CARB HARD		0.00	0.00	0.00	13.40	138
LAB CONDUCTIVITY		3609	2233	4440	2076	2580
FIELD COND.		2000	1500	0.00	1310	2400
LAB pH		9.58	8.28	8.53	8.62	7.87
FIELD pH		9.45	7.92	8.10	7.23	7.05

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3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WATER QUALITY SUMMARY COAL AQUIFERS 4 of 7

MEAN CONCENTRATIONS

DATE		NCR30A	NCRP32	NCR40B	NCR36A	NCR39A
POTASSIUM	PPM	11.17	41.80	30.83	14.00	11.00
SODIUM	PPM	182	691	47.67	588	384
CALCIUM	PPM	101	116	426	248	134
MAGNESIUM	PPM	46.67	99.40	3.40	160	84.50
SULFATE	PPM	391	1914	279	2073	1292
CHLORIDE	PPM	9.67	41.80	13.50	12.14	11.83
CARBONATE	PPM	0.00	2.40	44.00	0.00	0.00
BICARBONATE	PPM	556	238	299	528	233
FLOURIDE	PPM	0.50	1.34	0.24	0.23	0.34
SILICON DIO	PPM	27.43	18.60	4.17	22.86	11.00
TOTAL P	PPM	0.10	0.02	0.10	0.05	0.07
NITRATE	PPM	0.22	0.38	2.77	2.51	0.28
POTASSIUM	EPM	0.29	1.07	0.79	0.36	0.28
SODIUM	EPM	7.92	30.06	2.07	25.57	16.70
CALCIUM	EPM	5.06	5.80	21.28	12.38	6.70
MAGNESIUM	EPM	3.84	8.18	0.28	13.13	6.95
SULFATE	EPM	8.14	39.85	5.80	43.17	26.90
CHLORIDE	EPM	0.27	1.18	0.38	0.34	0.33
CARBONATE	EPM	0.00	0.08	1.47	0.00	0.00
BICARBONATE	EPM	9.11	3.89	4.91	8.66	3.82
FLOURIDE	EPM	0.03	0.07	0.01	0.01	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		43.38	45.10	38.07	51.43	30.63
TOTAL ANIONS		37.84	44.77	12.47	52.09	30.98
DEVIATION		98.96	99.20	45.21	101	101
TDS (calc.)		998	3024	1128	3355	2032
TDS @180		1008	3012	1278	3501	2068
TOTAL HARDNESS		445	698	1076	1275	681
ALKALINITY		428	199	930	433	191
NON-CARB HARD		30.00	501	171	842	490
LAB CONDUCTIVITY		1519	3871	2699	4182	2633
FIELD COND.		0.00	0.00	1820	2790	1975
LAB pH		7.48	7.88	0.00	7.81	8.07
FIELD pH		6.58	6.93	0.00	7.08	7.75

PAGE NUMBER

EPA-287 (Cin.)
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WATER QUALITY SUMMARY COAL AQUIFERS 5 of 7

MEAN CONCENTRATIONS

DATE		NCR40A	NCRP18	RBCW 8	NCR20A	NCR20B
POTASSIUM	PPM	8.29	20.83	9.00	14.89	20.71
SODIUM	PPM	79.86	826	422	226	184
CALCIUM	PPM	191	7.80	81.44	155	131
MAGNESIUM	PPM	104	13.00	52.22	62.33	44.14
SULFATE	PPM	700	1394	877	750	741
CHLORIDE	PPM	10.86	13.17	11.22	10.67	10.43
CARBONATE	PPM	3.43	196	0.00	1.33	5.71
BICARBONATE	PPM	427	44.83	543	424	164
FLOURIDE	PPM	0.27	0.38	0.44	0.44	0.55
SILICON DIO	PPM	12.14	3.00	9.89	11.78	10.00
TOTAL P	PPM	0.04	0.03	0.03	0.04	0.05
NITRATE	PPM	0.23	0.68	0.04	0.37	0.50
POTASSIUM	EPM	0.21	0.53	0.23	0.38	0.53
SODIUM	EPM	3.47	35.92	18.35	9.83	7.99
CALCIUM	EPM	9.53	0.39	4.06	7.72	6.52
MAGNESIUM	EPM	8.56	1.07	4.30	5.13	3.63
SULFATE	EPM	14.58	29.02	18.25	15.62	15.42
CHLORIDE	EPM	0.31	0.37	0.32	0.30	0.29
CARBONATE	EPM	0.11	6.54	0.00	0.04	0.19
BICARBONATE	EPM	7.00	0.73	8.90	6.95	2.69
FLOURIDE	EPM	0.01	0.02	0.02	0.02	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		21.77	59.68	26.94	23.06	18.67
TOTAL ANIONS		21.93	36.59	27.40	22.86	18.55
DEVIATION		101	84.65	102	99.00	99.54
TDS (calc.)		1308	2482	1720	1427	1266
TDS @180		1387	2426	1710	1459	1230
TOTAL HARDNESS		904	65.00	418	642	508
ALKALINITY		356	385	445	358	145
NON-CARB HARD		548	0.00	7.56	284	363
LAB CONDUCTIVITY		1642	3716	2390	2009	1673
FIELD COND.		1210	0.00	1670	1430	1170
LAB pH		7.63	9.70	7.71	7.67	8.10
FIELD pH		6.68	9.40	7.34	6.73	8.48

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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WATER QUALITY SUMMARY COAL AQUIFERS 6 of 7

MEAN CONCENTRATIONS

DATE		NCR35A	NCRP9A	NCRP9B
POTASSIUM	PPM	11.17	5.80	11.00
SODIUM	PPM	377	333	124
CALCIUM	PPM	247	24.40	15.40
MAGNESIUM	PPM	164	11.40	21.80
SULFATE	PPM	1723	63.40	214
CHLORIDE	PPM	12.50	19.60	8.00
CARBONATE	PPM	0.00	31.20	20.40
BICARBONATE	PPM	406	834	179
FLOURIDE	PPM	0.22	3.16	0.93
SILICON DIO	PPM	24.50	9.40	20.00
TOTAL P	PPM	0.05	0.04	0.04
NITRATE	PPM	0.68	2.30	0.04
POTASSIUM	EPM	0.29	0.15	0.28
SODIUM	EPM	16.42	14.47	5.39
CALCIUM	EPM	12.32	1.22	0.77
MAGNESIUM	EPM	13.46	0.94	1.79
SULFATE	EPM	35.88	1.32	4.46
CHLORIDE	EPM	0.35	0.55	0.23
CARBONATE	EPM	0.00	1.04	0.68
BICARBONATE	EPM	6.66	13.68	2.94
FLOURIDE	EPM	0.01	0.17	0.05
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		42.49	16.77	8.24
TOTAL ANIONS		42.81	16.61	8.29
DEVIATION		101	99.24	101
TDS (calc.)		2735	899	503
TDS @180		2893	915	520
TOTAL HARDNESS		1287	108	128
ALKALINITY		333	736	181
NON-CARB HARD		954	0.00	0.00
LAB CONDUCTIVITY		3197	1471	811
FIELD COND.		2080	1000	640
LAB pH		7.75	8.30	8.56
FIELD pH		7.10	7.15	7.33

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WATER QUALITY SUMMARY COAL AQUIFERS 7 of 7

MEAN CONCENTRATIONS

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	16.99	15.18	28.00
SODIUM	PPM	384	264	28.00
CALCIUM	PPM	113	102	28.00
MAGNESIUM	PPM	47.65	43.70	28.00
SULFATE	PPM	755	558	28.00
CHLORIDE	PPM	12.88	6.57	28.00
CARBONATE	PPM	35.10	69.62	28.00
BICARBONATE	PPM	526	317	28.00
FLOURIDE	PPM	1.38	1.66	28.00
SILICON DIO	PPM	16.21	10.19	28.00
TOTAL P	PPM	0.14	0.31	28.00
NITRATE	PPM	0.98	1.28	28.00
POTASSIUM	EPM	0.43		
SODIUM	EPM	16.68		
CALCIUM	EPM	5.66		
MAGNESIUM	EPM	3.92		
SULFATE	EPM	15.72		
CHLORIDE	EPM	0.36		
CARBONATE	EPM	1.17		
BICARBONATE	EPM	8.62		
FLOURIDE	EPM	0.07		
NITRATE	EPM	0.00		
TOTAL CATIONS		31.11	15.14	28.00
TOTAL ANIONS		27.68	13.13	28.00
DEVIATION		97.73	15.30	28.00
TDS (calc.)		1619	792	28.00
TDS @180		1654	802	28.00
TOTAL HARDNESS		458	364	28.00
ALKALINITY		519	296	28.00
NON-CARB HARD		183	263	28.00
LAB CONDUCTIVITY		2356	963	28.00
FIELD COND.		1214	795	28.00
LAB pH		7.82	1.61	28.00
FIELD pH		6.91	2.04	28.00

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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP13A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3780

DATE	LEVEL	READING	CHANGE
6 3 1976	3759.82	20.18	00.00
7 8 1976	3773.51	6.49	-13.69
7 28 1976	3772.94	7.06	00.57
9 8 1976	3772.31	7.69	00.63
9 23 1976	3772.44	7.56	-00.13
10 21 1976	3776.73	3.27	-04.29
11 17 1976	3772.86	7.14	03.87
12 13 1976	3772.93	7.07	-00.07
2 17 1977	3773.17	6.83	-00.24
3 21 1977	3773.53	6.47	-00.36
4 25 1977	3775.16	4.84	-01.63
5 24 1977	3774.90	5.10	00.26
6 16 1977	3774.53	5.47	00.37
7 28 1977	3773.65	6.35	00.88
8 29 1977	3772.84	7.16	00.81
10 6 1977	3772.76	7.24	00.08
10 21 1977	3772.86	7.14	-00.10
10 28 1977	3730.79	49.21	42.07
12 18 1977	3769.56	10.44	-38.77
1 18 1978	3772.00	8.00	-02.44
6 6 1978	3779.37	0.63	-07.37
7 5 1978	3778.89	1.11	00.48
9 5 1978	3777.60	2.40	01.29
10 23 1978	3777.12	2.88	00.48
12 8 1978	3776.59	3.41	00.53
3 13 1979	3775.74	4.26	00.85
3 22 1979	3775.55	4.45	00.19
4 18 1979	3775.73	4.27	-00.18
5 24 1979	3775.75	4.25	-00.02
6 13 1979	3775.77	4.23	-00.02
7 20 1979	3775.51	4.49	00.26
8 9 1979	3775.48	4.52	00.03

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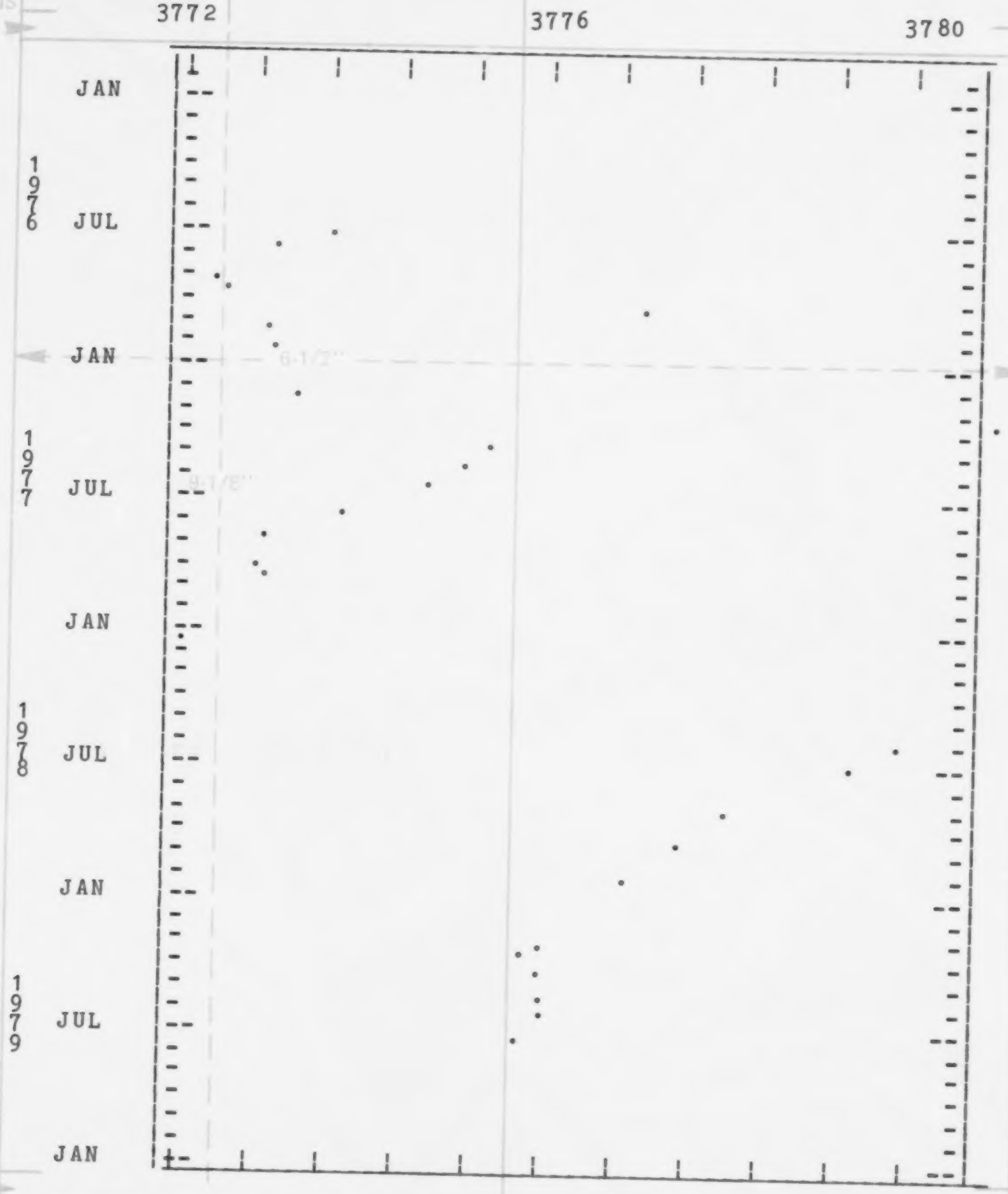
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP13A

WATER LEVEL (FEET ABOVE MSL)



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3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL NCRP 13A 1 of 2

DATE		121376	032177	061677	102177	121877
POTASSIUM	PPM	10.00	8.00	10.00	8.00	12.00
SODIUM	PPM	37.00	42.00	40.00	40.00	47.00
CALCIUM	PPM	32.00	8.00	10.00	10.00	10.00
MAGNESIUM	PPM	43.00	57.00	56.00	54.00	55.00
SULFATE	PPM	196	138	130	121	146
CHLORIDE	PPM	8.00	6.00	7.00	8.00	7.00
CARBONATE	PPM	38.00	60.00	54.00	48.00	24.00
BICARBONATE	PPM	107	122	134	159	207
FLOURIDE	PPM	0.50	0.70	0.60	0.60	0.48
SILICON DIO	PPM	1.00	1.00	1.00	1.00	1.00
TOTAL P	PPM	0.04	0.02	0.08	0.01	0.01
NITRATE	PPM	1.00	0.10	0.10	0.30	0.10
POTASSIUM	EPM	0.26	0.20	0.26	0.20	0.31
SODIUM	EPM	1.61	1.83	1.74	1.74	2.04
CALCIUM	EPM	1.60	0.40	0.50	0.50	0.50
MAGNESIUM	EPM	3.54	4.69	4.61	4.44	4.52
SULFATE	EPM	4.08	2.87	2.71	2.52	3.04
CHLORIDE	EPM	0.23	0.17	0.20	0.23	0.20
CARBONATE	EPM	1.27	2.00	1.80	1.60	0.80
BICARBONATE	EPM	1.75	2.00	2.20	2.61	3.39
FLOURIDE	EPM	0.03	0.04	0.03	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		7.00	7.12	7.10	6.89	7.37
TOTAL ANIONS		7.29	7.03	6.88	6.92	7.40
DEVIATION		104	98.81	96.90	101	100
TDS (calc.)		417	379	373	367	403
TDS @180		351	367	391	358	378
TOTAL HARDNESS		257	255	253	245	249
ALKALINITY		152	200	200	210	210
NON-CARB HARD		105	55.00	53.00	35.00	39.00
LAB CONDUCTIVITY		550	660	650	617	647
FIELD COND.					410	378
LAB pH		9.20	9.30	9.00	9.00	9.00
FIELD pH		6.80	9.30			

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL NCRP 13A 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	9.60	1.50	5.00
SODIUM	PPM	41.20	3.31	5.00
CALCIUM	PPM	14.00	9.03	5.00
MAGNESIUM	PPM	53.00	5.10	5.00
SULFATE	PPM	146	26.25	5.00
CHLORIDE	PPM	7.20	0.75	5.00
CARBONATE	PPM	44.80	12.69	5.00
BICARBONATE	PPM	146	35.02	5.00
FLOURIDE	PPM	0.58	0.08	5.00
SILICON DIO	PPM	0.60	0.80	5.00
TOTAL P	PPM	0.02	0.03	5.00
NITRATE	PPM	0.16	0.45	5.00
POTASSIUM	EPM	0.25		
SODIUM	EPM	1.79		
CALCIUM	EPM	0.70		
MAGNESIUM	EPM	4.36		
SULFATE	EPM	3.04		
CHLORIDE	EPM	0.20		
CARBONATE	EPM	1.49		
BICARBONATE	EPM	2.39		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		7.10	0.16	5.00
TOTAL ANIONS		7.11	0.21	5.00
DEVIATION		100	2.41	5.00
TDS (calc.)		388	19.04	5.00
TDS @180		369	14.24	5.00
TOTAL HARDNESS		252	4.31	5.00
ALKALINITY		194	21.67	5.00
NON-CARB HARD		57.40	25.02	5.00
LAB CONDUCTIVITY		625	40.06	5.00
FIELD COND.		394	16.00	2.00
LAB pH		9.10	0.13	5.00
FIELD pH		8.05	1.25	2.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP13B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3790

DATE	LEVEL	READING	CHANGE
6 3 1976	3778.31	11.69	00.00
7 8 1976	3778.32	11.68	-00.01
7 28 1976	3777.81	12.19	00.51
9 8 1976	3777.38	12.62	00.43
9 23 1976	3777.28	12.72	00.10
10 21 1976	3776.96	13.04	00.32
1 16 1976	3777.75	12.25	-00.79
12 13 1976	3777.80	12.20	-00.05
1 18 1977	3777.84	12.16	-00.04
2 17 1977	3777.94	12.06	-00.10
3 21 1977	3777.99	12.01	-00.05
4 25 1977	3779.33	10.67	-01.34
5 24 1977	3778.72	11.28	00.61
6 15 1977	3778.58	11.42	00.14
7 28 1977	3777.78	12.22	00.80
8 29 1977	3776.04	13.96	01.74
10 6 1977	3777.65	12.35	-01.61
11 28 1977	3777.89	12.11	-00.24
12 18 1977	3777.31	12.69	00.58
1 18 1978	3779.24	10.76	-01.93
6 6 1978	3780.84	9.16	-01.60
7 5 1978	3779.60	10.40	01.24
9 5 1978	3778.22	11.78	01.38
10 23 1978	3778.68	11.32	-00.46
12 8 1978	3778.80	11.20	-00.12
2 28 1979	3778.87	11.13	-00.07
3 13 1979	3779.31	10.69	-00.44
3 22 1979	3778.63	11.36	00.68
4 18 1979	3780.36	9.64	-01.72
5 24 1979	3779.72	10.28	00.64
6 13 1979	3778.58	11.42	01.14
7 20 1979	3778.37	11.63	00.21
8 9 1979	3776.23	13.77	02.14

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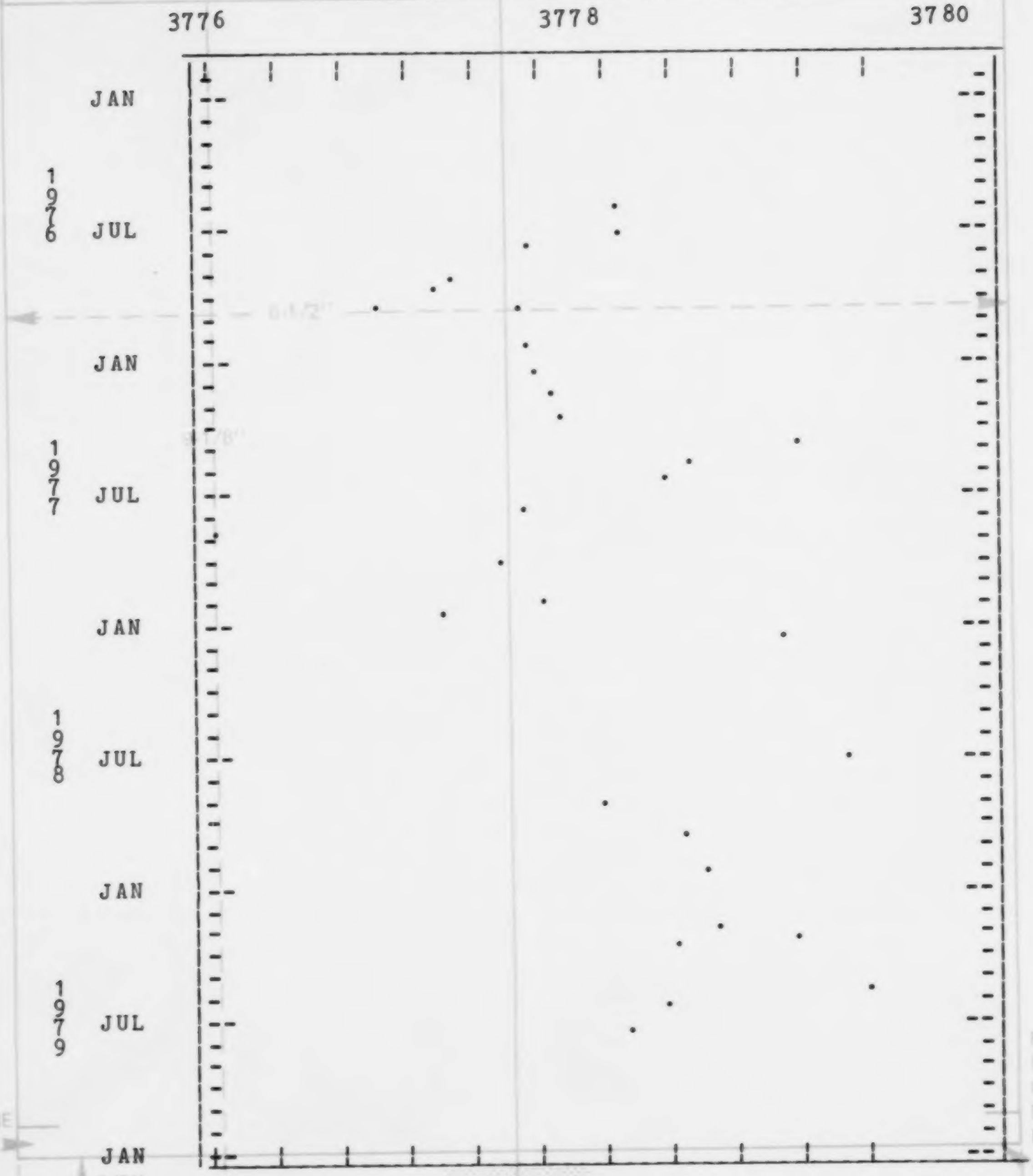
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP13B

WATER LEVEL (FEET ABOVE MSL)



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3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 13B (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		070876	092376	121376	032177	061577
POTASSIUM	PPM	14.00	10.00	10.00	12.00	13.00
SODIUM	PPM	57.00	60.00	56.00	60.00	60.00
CALCIUM	PPM	91.00	184	172	129	146
MAGNESIUM	PPM	67.00	22.00	31.00	55.00	40.00
SULFATE	PPM	192	195	181	177	188
CHLORIDE	PPM	9.00	10.00	11.00	8.00	10.00
CARBONATE	PPM	0.00	0.00	48.00	0.00	0.00
BICARBONATE	PPM	519	586	476	573	573
FLOURIDE	PPM	0.60	0.70	0.60	0.80	0.68
SILICON DIO	PPM	19.00	18.00	23.00	28.00	28.00
TOTAL P	PPM	0.11	0.01	0.04	0.02	0.10
NITRATE	PPM	3.00	1.00	3.00	0.10	0.10
POTASSIUM	EPM	0.36	0.26	0.26	0.31	0.33
SODIUM	EPM	2.48	2.61	2.44	2.61	2.61
CALCIUM	EPM	4.54	9.18	8.58	6.44	7.29
MAGNESIUM	EPM	5.51	1.81	2.55	4.52	3.29
SULFATE	EPM	4.00	4.06	3.77	3.69	3.91
CHLORIDE	EPM	0.25	0.28	0.31	0.23	0.28
CARBONATE	EPM	0.00	0.00	1.60	0.00	0.00
BICARBONATE	EPM	8.51	9.60	7.80	9.39	9.39
FLOURIDE	EPM	0.03	0.04	0.03	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		12.89	13.86	13.82	13.88	13.52
TOTAL ANIONS		12.72	13.91	13.43	13.29	13.55
DEVIATION		98.72	100	97.15	95.73	100
TDS (calc.)		685	769	743	723	739
TDS @180		689	759	763	723	773
TOTAL HARDNESS		502	548	557	547	529
ALKALINITY		425	480	470	470	470
NON-CARB HARD		77.00	68.00	87.00	77.00	59.00
LAB CONDUCTIVITY		1100	800	1040	1200	1222
FIELD COND.						
LAB pH		7.80	7.70	8.10	7.80	7.70
FIELD pH		7.60	6.30	7.20	7.30	

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 13B (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		100677	121877	MEAN	ST.DEV	#
POTASSIUM	PPM	15.00	12.00	12.29	1.75	7.00
SODIUM	PPM	70.00	58.00	60.14	4.29	7.00
CALCIUM	PPM	84.00	82.00	127	39.30	7.00
MAGNESIUM	PPM	73.00	87.00	53.57	21.93	7.00
SULFATE	PPM	184	178	185	6.41	7.00
CHLORIDE	PPM	10.00	8.00	9.43	1.05	7.00
CARBONATE	PPM	0.00	0.00	6.86	16.80	7.00
BICARBONATE	PPM	586	598	559	41.16	7.00
FLOURIDE	PPM	0.60	0.66	0.66	0.07	7.00
SILICON DIO	PPM	25.00	29.00	24.29	4.13	7.00
TOTAL P	PPM	0.27	0.03	0.08	0.09	7.00
NITRATE	PPM	0.10	0.10	0.94	1.35	7.00
POTASSIUM	EPM	0.38	0.31	0.31		
SODIUM	EPM	3.05	2.52	2.62		
CALCIUM	EPM	4.19	4.09	6.33		
MAGNESIUM	EPM	6.00	7.16	4.41		
SULFATE	EPM	3.83	3.71	3.85		
CHLORIDE	EPM	0.28	0.23	0.27		
CARBONATE	EPM	0.00	0.00	0.23		
BICARBONATE	EPM	9.60	9.80	9.16		
FLOURIDE	EPM	0.03	0.03	0.03		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		13.63	14.08	13.67	0.36	7.00
TOTAL ANIONS		13.68	13.71	13.47	0.36	7.00
DEVIATION		100	97.38	98.57	1.73	7.00
TDS (calc.)		724	719	729	23.88	7.00
TDS @180		778	731	745	29.78	7.00
TOTAL HARDNESS		510	563	537	21.76	7.00
ALKALINITY		480	490	469	19.35	7.00
NON-CARB HARD		30.00	73.00	67.29	17.19	7.00
LAB CONDUCTIVITY		1156	1254	1110	144	7.00
FIELD COND.		810	720	765	45.00	2.00
LAB pH		7.70	7.60	7.77	0.15	7.00
FIELD pH		7.50		7.18	0.46	5.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW2

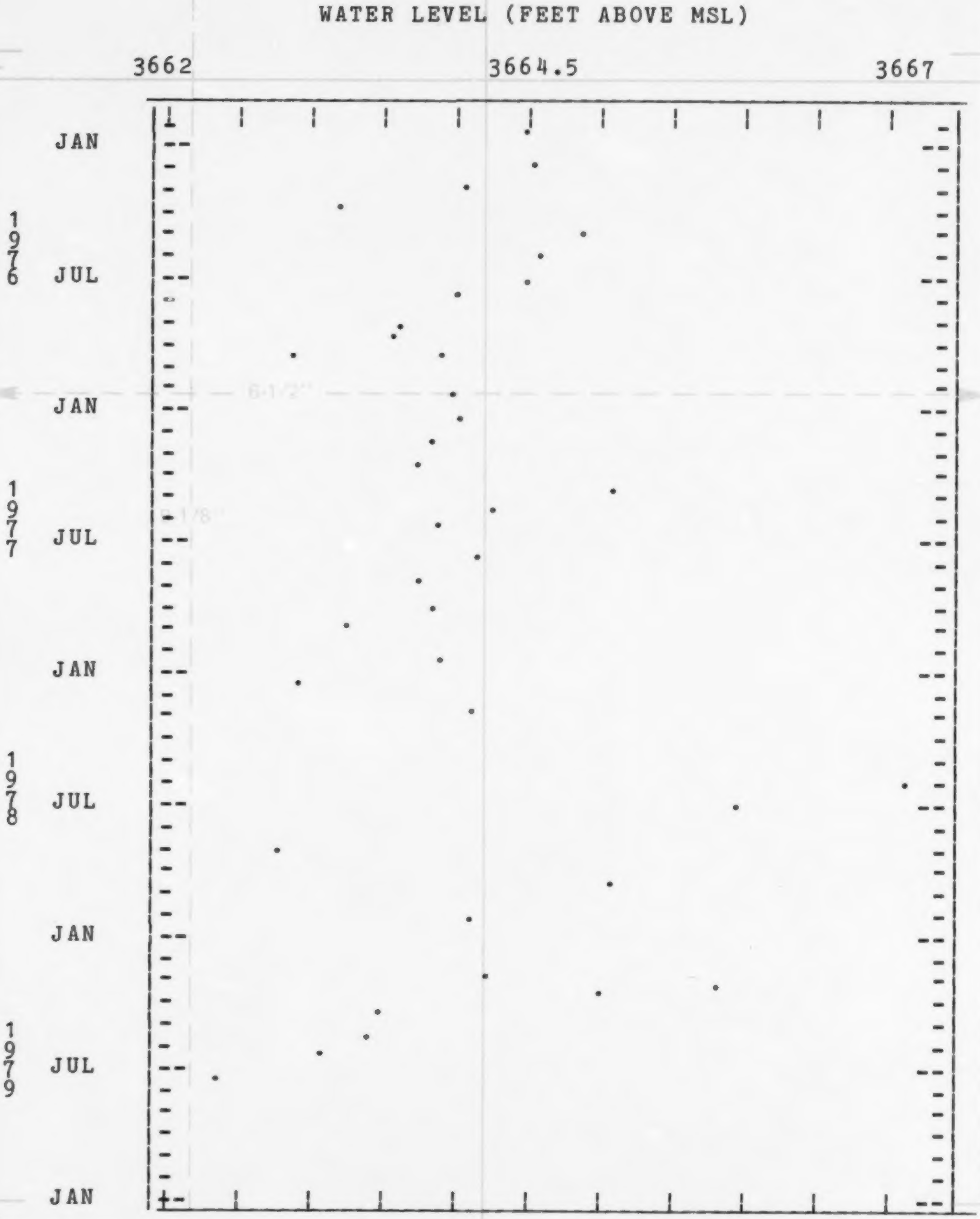
GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3691

DATE	LEVEL	READING	CHANGE
12 18 1975	3664.32	26.68	00.00
1 28 1976	3664.37	26.63	-00.05
3 4 1976	3663.93	27.07	00.44
3 30 1976	3663.12	27.88	00.81
5 4 1976	3664.69	26.31	-01.57
6 3 1976	3664.41	26.59	00.28
7 8 1976	3664.33	26.67	00.08
7 28 1976	3663.88	27.12	00.45
9 8 1976	3663.50	27.50	00.38
9 23 1976	3663.47	27.53	00.03
10 21 1976	3662.82	28.18	00.65
1 17 1976	3663.78	27.22	-00.96
12 13 1976	3663.85	27.15	-00.07
1 18 1977	3663.90	27.10	-00.05
2 17 1977	3663.72	27.28	00.18
3 21 1977	3663.63	27.37	00.09
4 25 1977	3664.89	26.11	-01.26
5 23 1977	3664.11	26.89	00.78
6 15 1977	3663.76	27.24	00.35
7 28 1977	3664.01	26.99	-00.25
8 29 1977	3663.64	27.36	00.37
10 6 1977	3663.73	27.27	-00.09
10 28 1977	3663.17	27.83	00.56
12 18 1977	3663.78	27.22	-00.61
1 18 1978	3662.86	28.14	00.92
3 1 1978	3663.98	27.02	-01.12
6 6 1978	3666.79	24.21	-02.81
7 5 1978	3665.70	25.30	01.09
9 5 1978	3662.73	28.27	02.97
10 23 1978	3664.88	26.12	-02.15
12 8 1978	3663.97	27.03	00.91
2 28 1979	3664.08	26.92	-00.11
3 13 1979	3665.57	25.43	-01.49
3 22 1979	3664.80	26.20	00.77
4 18 1979	3663.39	27.61	01.41
5 24 1979	3663.30	27.70	00.09
6 13 1979	3663.00	28.00	00.30
7 20 1979	3662.34	28.66	00.66
8 9 1979	3662.40	28.60	-00.06

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL RBCW2



EPA-287 (Cin.)
(4-76)

WELL RBCW 2 1 of 3

DATE		121975	033076	070876	092376	121376
POTASSIUM	PPM	10.00	10.00	10.00	12.00	10.00
SODIUM	PPM	60.00	62.00	61.00	62.00	65.00
CALCIUM	PPM	89.00	88.00	70.00	182	196
MAGNESIUM	PPM	81.00	82.00	79.00	25.00	14.00
SULFATE	PPM	230	236	243	232	231
CHLORIDE	PPM	4.00	5.00	6.00	10.00	9.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	549	573	476	561	549
FLOURIDE	PPM	0.80	0.80	0.70	0.80	0.60
SILICON DIO	PPM	21.00	11.00	24.00	28.00	23.00
TOTAL P	PPM	0.03	0.10	0.09	0.01	0.04
NITRATE	PPM	0.30	1.00	1.00	1.00	2.00
POTASSIUM	EPM	0.26	0.26	0.26	0.31	0.26
SODIUM	EPM	2.61	2.70	2.65	2.70	2.83
CALCIUM	EPM	4.44	4.39	3.49	9.08	9.78
MAGNESIUM	EPM	6.66	6.75	6.50	2.06	1.15
SULFATE	EPM	4.79	4.91	5.06	4.83	4.81
CHLORIDE	EPM	0.11	0.14	0.17	0.28	0.25
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.00	9.39	7.80	9.19	9.00
FLOURIDE	EPM	0.04	0.04	0.04	0.04	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.97	14.09	12.90	14.14	14.02
TOTAL ANIONS		13.91	14.45	13.02	14.28	14.03
DEVIATION		99.59	103	101	101	100
TDS (calc.)		744	765	703	799	795
TDS @180		796	816	700	795	785
TOTAL HARDNESS		556	597	497	557	548
ALKALINITY		450	470	390	460	450
NON-CARB HARD		106	127	107	97.00	98.00
LAB CONDUCTIVITY		1136	1200	1200	850	1120
FIELD COND.						
LAB pH		7.30	7.30	7.90	7.70	7.90
FIELD pH		7.00	6.80	7.20	6.70	6.40

8-1/2''
9-1/8''
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 2 2 of 3

DATE		032177	061577	100677	121877
POTASSIUM	PPM	12.00	12.00	15.00	12.00
SODIUM	PPM	60.00	70.00	80.00	68.00
CALCIUM	PPM	119	138	76.00	80.00
MAGNESIUM	PPM	62.00	48.00	83.00	84.00
SULFATE	PPM	221	226	218	210
CHLORIDE	PPM	5.00	8.00	9.00	7.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	537	549	573	573
FLOURIDE	PPM	0.80	0.74	0.68	0.72
SILICON DIO	PPM	28.00	29.00	27.00	30.00
TOTAL P	PPM	0.01	0.10	0.25	0.01
NITRATE	PPM	0.90	0.90	0.10	0.90
POTASSIUM	EPM	0.31	0.31	0.38	0.31
SODIUM	EPM	2.61	3.05	3.48	2.96
CALCIUM	EPM	5.94	6.89	3.79	3.99
MAGNESIUM	EPM	5.10	3.95	6.83	6.91
SULFATE	EPM	4.60	4.71	4.54	4.37
CHLORIDE	EPM	0.14	0.23	0.25	0.20
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.80	9.00	9.39	9.39
FLOURIDE	EPM	0.04	0.04	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		13.96	14.19	14.48	14.17
TOTAL ANIONS		13.55	13.91	14.16	13.95
DEVIATION		97.09	98.05	97.75	98.45
TDS (calc.)		743	772	763	743
TDS @180		759	764	792	805
TOTAL HARDNESS		551	543	529	543
ALKALINITY		440	450	470	470
NON-CARB HARD		111	93.00	59.00	73.00
LAB CONDUCTIVITY		1200	1183	1186	1156
FIELD COND.				850	780
LAB pH		7.70	7.70	7.60	7.50
FIELD pH		7.10		7.20	

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 2

3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	11.44	1.57	9.00
SODIUM	PPM	65.33	6.16	9.00
CALCIUM	PPM	115	44.43	9.00
MAGNESIUM	PPM	62.00	25.48	9.00
SULFATE	PPM	227	9.38	9.00
CHLORIDE	PPM	7.00	2.00	9.00
CARBONATE	PPM	0.00	0.00	9.00
BICARBONATE	PPM	549	28.57	9.00
FLOURIDE	PPM	0.74	0.07	9.00
SILICON DIO	PPM	24.56	5.56	9.00
TOTAL P	PPM	0.04	0.09	9.00
NITRATE	PPM	0.21	1.01	9.00
POTASSIUM	EPM	0.29		
SODIUM	EPM	2.84		
CALCIUM	EPM	5.76		
MAGNESIUM	EPM	5.10		
SULFATE	EPM	4.74		
CHLORIDE	EPM	0.20		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	9.00		
FLOURIDE	EPM	0.04		
NITRATE	EPM	0.00		
TOTAL CATIONS		13.99	0.41	9.00
TOTAL ANIONS		13.92	0.40	9.00
DEVIATION		99.50	1.70	9.00
TDS (calc.)		759	27.86	9.00
TDS @180		779	32.76	9.00
TOTAL HARDNESS		547	24.84	9.00
ALKALINITY		450	23.57	9.00
NON-CARB HARD		96.78	19.19	9.00
LAB CONDUCTIVITY		1137	105	9.00
FIELD COND.		815	35.00	2.00
LAB pH		7.62	0.21	9.00
FIELD pH		6.91	0.27	7.00

8-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW4

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3500

DATE	LEVEL	READING	CHANGE
12 18 1975	3441.77	58.23	00.00
1 28 1976	3443.83	56.17	-02.06
3 4 1976	3444.00	56.00	-00.17
3 30 1976	3444.02	55.98	-00.02
5 4 1976	3444.12	55.88	-00.10
6 3 1976	3444.15	55.85	-00.03
7 8 1976	3444.00	56.00	00.15
7 28 1976	3444.09	55.91	-00.09
9 8 1976	3443.81	56.19	00.28
9 23 1976	3443.01	56.99	00.80
10 21 1976	3437.88	62.12	05.13
1 17 1976	3444.12	55.88	-06.24
12 13 1976	3443.74	56.26	00.38
1 18 1977	3444.03	55.97	-00.29
2 17 1977	3443.99	56.01	00.04
3 21 1977	3439.17	60.83	04.82
4 25 1977	3443.87	56.13	-04.70
5 24 1977	3443.85	56.15	00.02
6 15 1977	3443.47	56.53	00.38
7 28 1977	3424.57	75.43	18.90
10 6 1977	3440.64	59.36	-16.07
10 28 1977	3443.76	56.24	-03.12
12 18 1978	3443.64	56.36	00.12
6 1 1978.	3443.66	56.34	-00.02
6 6 1978	3442.14	57.86	01.52
7 5 1978	3443.96	56.04	-01.82
9 5 1978	3437.80	62.20	06.16
2 28 1979	3446.37	53.63	-08.57
3 22 1979	3446.30	53.70	00.07
4 18 1979	3442.38	57.62	03.92
5 24 1979	3445.83	54.17	-03.45
6 13 1979	3436.21	63.79	09.62
7 20 1979	3443.21	56.79	-07.00
8 9 1979	3442.71	57.29	00.50

6-1/2"
1-1/8"
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3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
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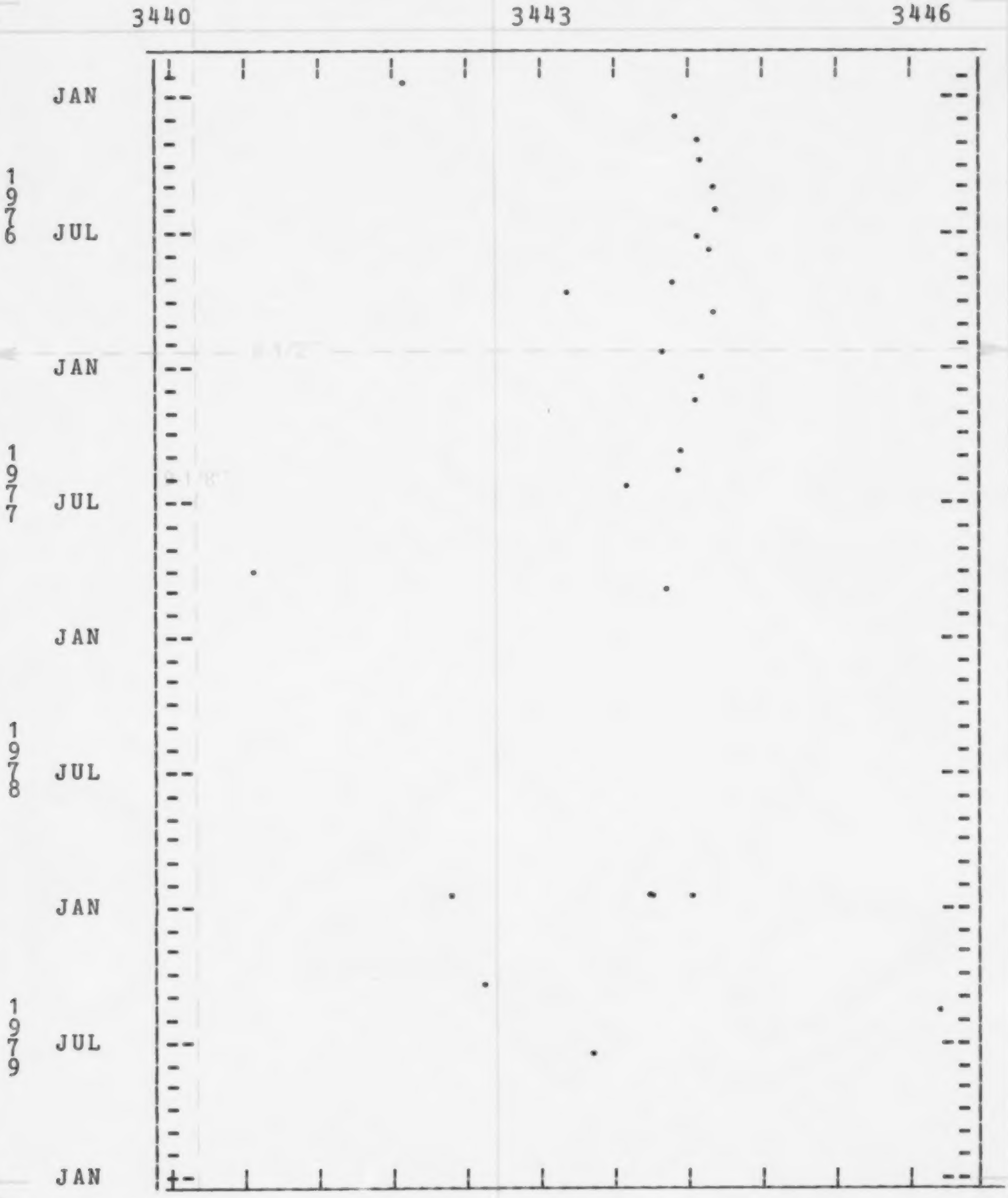
HYDROGRAPH FOR WELL RBCW4

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 4

1 of 3

DATE		121975	033076	070876	092376	092376
POTASSIUM	PPM	2.00	2.00	3.00	4.00	4.00
SODIUM	PPM	20.00	22.00	25.00	26.00	26.00
CALCIUM	PPM	50.00	56.00	50.00	58.00	58.00
MAGNESIUM	PPM	27.00	32.00	32.00	29.00	29.00
SULFATE	PPM	41.00	55.00	58.00	49.00	49.00
CHLORIDE	PPM	4.00	3.00	6.00	9.00	9.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	305	317	311	305	305
FLOURIDE	PPM	0.20	0.20	0.20	0.20	0.20
SILICON DIO	PPM	11.00	8.00	10.00	13.00	13.00
TOTAL P	PPM	0.06	0.10	0.04	0.01	0.01
NITRATE	PPM	1.50	2.00	5.00	3.00	3.00
POTASSIUM	EPM	0.05	0.05	0.08	0.10	0.10
SODIUM	EPM	0.87	0.96	1.09	1.13	1.13
CALCIUM	EPM	2.49	2.79	2.49	2.89	2.89
MAGNESIUM	EPM	2.22	2.63	2.63	2.39	2.39
SULFATE	EPM	0.85	1.15	1.21	1.02	1.02
CHLORIDE	EPM	0.11	0.08	0.17	0.25	0.25
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	5.00	5.20	5.10	5.00	5.00
FLOURIDE	EPM	0.01	0.01	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		5.64	6.43	6.29	6.51	6.51
TOTAL ANIONS		5.95	6.41	6.44	6.22	6.22
DEVIATION		106	99.65	102	95.45	95.45
TDS (calc.)		292	325	327	325	325
TDS @180		342	338	258	325	325
TOTAL HARDNESS		236	271	256	263	263
ALKALINITY		250	260	255	250	250
NON-CARB HARD		0.00	11.00	1.00	13.00	13.00
LAB CONDUCTIVITY		455	600	600	400	400
FIELD COND.						
LAB pH		8.30	8.20	7.90	7.70	7.70
FIELD pH		6.80	7.40	7.20	6.20	6.20

1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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TYPING GUIDE SHEET

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TOP OF IMAGE AREA

DROPPED HEAD: BEGIN SECTIONS HERE

WELL RBCW 4 2 of 3

DATE		121376	032177	061577	100677	121877
POTASSIUM	PPM	2.00	2.00	2.00	3.00	3.00
SODIUM	PPM	18.00	20.00	15.00	32.00	41.00
CALCIUM	PPM	56.00	53.00	49.00	52.00	50.00
MAGNESIUM	PPM	30.00	28.00	24.00	35.00	36.00
SULFATE	PPM	44.00	41.00	41.00	57.00	62.00
CHLORIDE	PPM	5.00	5.00	6.00	8.00	8.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	287	281	244	342	354
FLOURIDE	PPM	0.20	0.20	0.14	0.18	0.18
SILICON DIO	PPM	10.00	12.00	10.00	13.00	14.00
TOTAL P	PPM	0.07	0.01	0.08	0.12	0.01
NITRATE	PPM	6.00	3.60	0.90	3.30	2.30
POTASSIUM	EPM	0.05	0.05	0.05	0.08	0.08
SODIUM	EPM	0.78	0.87	0.65	1.39	1.78
CALCIUM	EPM	2.79	2.64	2.45	2.59	2.49
MAGNESIUM	EPM	2.47	2.30	1.97	2.88	2.96
SULFATE	EPM	0.92	0.85	0.85	1.19	1.29
CHLORIDE	EPM	0.14	0.14	0.17	0.23	0.23
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	4.70	4.61	4.00	5.61	5.80
FLOURIDE	EPM	0.01	0.01	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		6.10	5.87	5.12	6.94	7.32
TOTAL ANIONS		5.74	5.57	4.99	6.97	7.27
DEVIATION		94.08	94.97	97.33	100	99.35
TDS (calc.)		296	287	257	355	374
TDS @180		303	295	297	368	416
TOTAL HARDNESS		263	247	220	274	274
ALKALINITY		235	230	200	280	290
NON-CARB HARD		28.00	17.00	20.00	0.00	0.00
LAB CONDUCTIVITY		500	560	495	647	666
FIELD COND.					461	419
LAB pH		7.90	7.80	7.80	7.60	7.60
FIELD pH		7.20	7.10		7.04	

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

WELL RBCW 4

3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	2.70	0.78	10.00
SODIUM	PPM	24.50	7.16	10.00
CALCIUM	PPM	53.20	3.34	10.00
MAGNESIUM	PPM	30.20	3.46	10.00
SULFATE	PPM	49.70	7.50	10.00
CHLORIDE	PPM	6.30	2.00	10.00
CARBONATE	PPM	0.00	0.00	10.00
BICARBONATE	PPM	305	29.28	10.00
FLOURIDE	PPM	0.19	0.02	10.00
SILICON DIO	PPM	11.40	1.80	10.00
TOTAL P	PPM	0.02	0.06	10.00
NITRATE	PPM	3.06	1.47	10.00
POTASSIUM	EPM	0.07		
SODIUM	EPM	1.07		
CALCIUM	EPM	2.65		
MAGNESIUM	EPM	2.48		
SULFATE	EPM	1.03		
CHLORIDE	EPM	0.18		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	5.00		
FLOURIDE	EPM	0.01		
NITRATE	EPM	0.00		
TOTAL CATIONS		6.27	0.60	10.00
TOTAL ANIONS		6.18	0.63	10.00
DEVIATION		98.46	3.48	10.00
TDS (calc.)		316	32.47	10.00
TDS @180		327	41.49	10.00
TOTAL HARDNESS		257	16.71	10.00
ALKALINITY		250	23.98	10.00
NON-CARB HARD		10.30	9.34	10.00
LAB CONDUCTIVITY		532	91.86	10.00
FIELD COND.		440	21.00	2.00
LAB pH		7.85	0.22	10.00
FIELD pH		6.89	0.43	8.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW7

GROUNDWATER LEVELS (FEET--DATUM MSL)

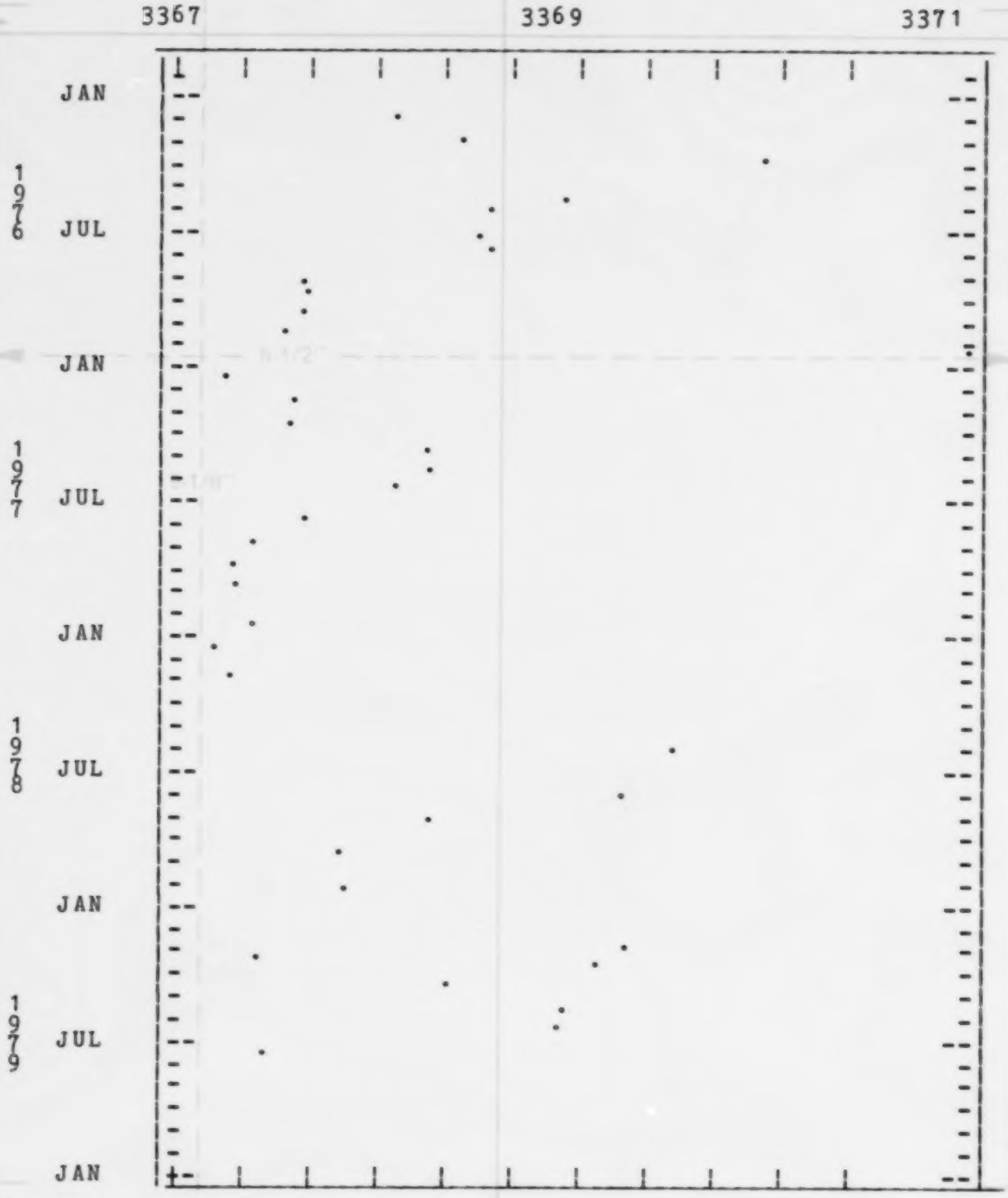
elevation at top of well casing is 3394

DATE	LEVEL	READING	CHANGE
1 28 1976	3368.22	25.78	00.00
3 4 1976	3368.58	25.42	-00.36
3 30 1976	3370.25	23.75	-01.67
5 21 1976	3369.15	24.85	01.10
6 3 1976	3368.74	25.26	00.41
7 8 1976	3368.68	25.32	00.06
7 28 1976	3368.74	25.26	-00.06
9 8 1976	3367.70	26.30	01.04
9 23 1976	3367.73	26.27	-00.03
10 21 1976	3367.71	26.29	00.02
11 17 1976	3367.61	26.39	00.10
12 14 1976	3367.66	26.34	-00.05
1 18 1977	3367.28	26.72	00.38
2 18 1977	3367.66	26.34	-00.38
3 21 1977	3367.64	26.36	00.02
4 25 1977	3368.39	25.61	-00.75
5 24 1977	3368.41	25.59	-00.02
6 15 1977	3368.22	25.78	00.19
7 28 1977	3367.72	26.28	00.50
8 30 1977	3367.43	26.57	00.29
9 29 1977	3367.32	26.68	00.11
10 27 1977	3367.34	26.66	-00.02
12 19 1977	3367.43	26.57	-00.09
1 18 1978	3367.22	26.78	00.21
3 1 1978	3367.31	26.69	-00.09
6 6 1978	3369.75	24.25	-02.44
8 8 1978	3369.47	24.53	00.28
9 5 1978	3368.41	25.59	01.06
10 23 1978	3367.91	26.09	00.50
12 8 1978	3367.94	26.06	-00.03
2 28 1979	3369.49	24.51	-01.55
3 13 1979	3367.46	26.54	02.03
3 22 1979	3369.33	24.67	-01.87
4 18 1979	3368.51	25.49	00.82
5 24 1979	3369.15	24.85	-00.64
6 13 1979	3369.12	24.88	00.03
7 20 1979	3367.50	26.50	01.62
8 9 1979	3368.36	25.64	-00.86

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL RBCW7



EPA-287 (Cin.)
(4-75)

WELL RBCW8

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3320

DATE	LEVEL	READING	CHANGE
12 17 1975	3269.73	50.27	00.00
1 28 1976	3270.37	49.63	-00.64
2 13 1976	3270.62	49.38	-00.25
3 4 1976	3270.94	49.06	-00.32
3 30 1976	3270.32	49.68	00.62
5 4 1976	3269.60	50.40	00.72
6 3 1976	3269.81	50.19	-00.21
7 8 1976	3269.91	50.09	-00.10
7 28 1976	3269.29	50.71	00.62
9 8 1976	3269.40	50.60	-00.11
9 28 1976	3269.47	50.53	-00.07
10 21 1976	3269.48	50.52	-00.01
11 17 1976	3269.58	50.42	-00.10
12 14 1976	3268.85	51.15	00.73
1 18 1977	3268.92	51.08	-00.07
2 18 1977	3269.75	50.25	-00.83
3 21 1977	3268.94	51.06	00.81
4 25 1977	3270.06	49.94	-01.12
5 24 1977	3270.00	50.00	00.06
6 15 1977	3267.04	52.96	02.96
7 28 1977	3269.21	50.79	-02.17
8 30 1977	3268.74	51.26	00.47
9 29 1977	3268.90	51.10	-00.16
10 28 1977	3268.73	51.27	00.17
12 19 1977	3269.59	50.41	-00.86
1 18 1978	3269.38	50.62	00.21
6 1 1978	3268.05	51.95	01.33
9 5 1978	3266.17	53.83	01.88
10 23 1978	3270.72	49.28	-04.55
2 28 1979	3268.89	51.11	01.83
4 18 1979	3272.26	47.74	-03.37
5 21 1979	3272.08	47.92	00.18
6 13 1979	3271.66	48.34	00.42
7 20 1979	3268.35	51.65	03.31
8 9 1979	3270.71	49.29	-02.36

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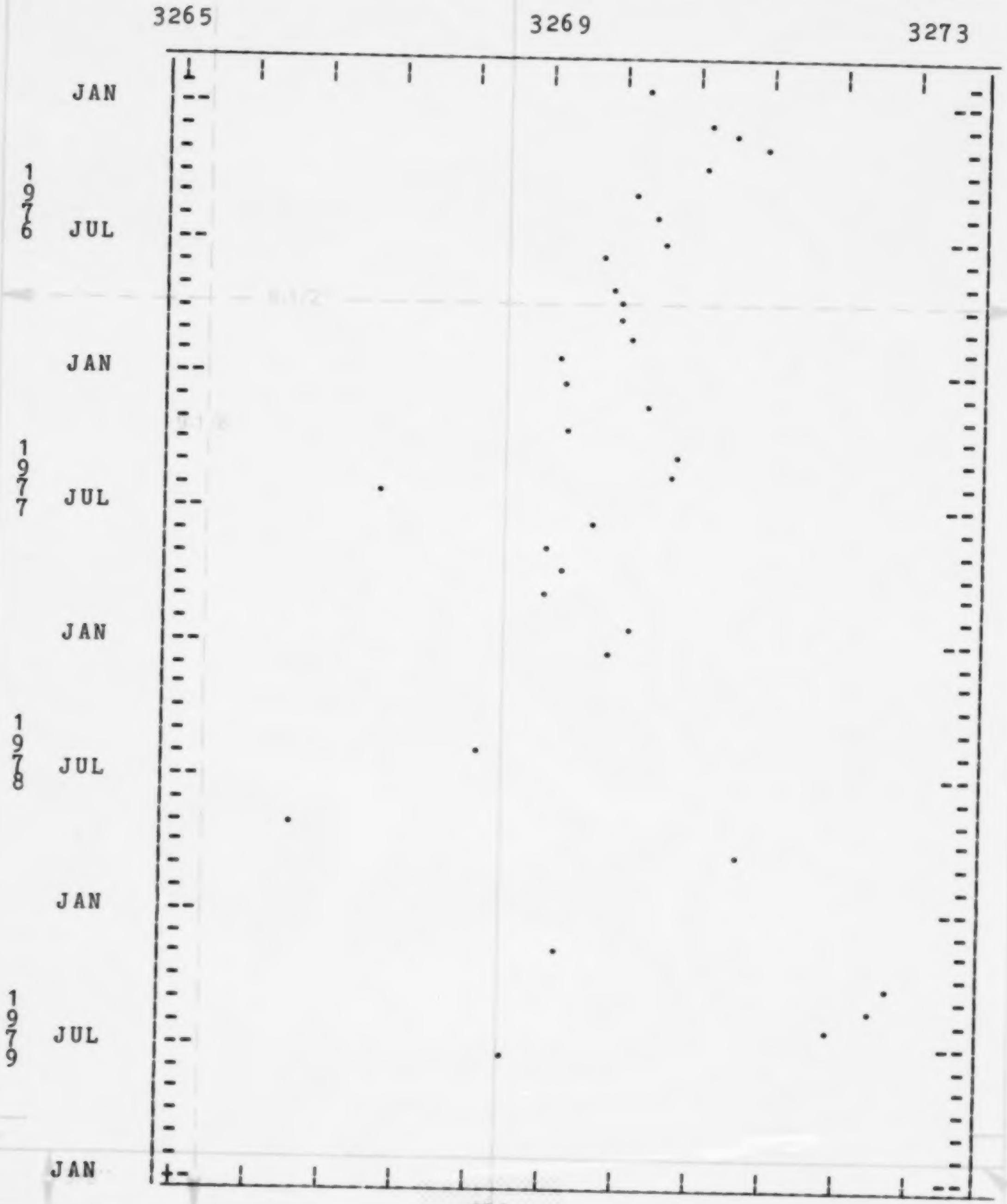
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL RBCW8



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 8 (SANDSTONE AQUIFER) 1 of 3

DATE		121875	033076	071276	092876	121476
POTASSIUM	PPM	8.00	10.00	14.00	6.00	7.00
SODIUM	PPM	440	425	440	400	400
CALCIUM	PPM	72.00	80.00	51.00	110	112
MAGNESIUM	PPM	56.00	59.00	58.00	43.00	54.00
SULFATE	PPM	877	878	877	866	875
CHLORIDE	PPM	4.00	8.00	10.00	10.00	16.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	543	561	567	531	549
FLOURIDE	PPM	0.50	0.50	0.40	0.40	0.40
SILICON DIO	PPM	9.00	7.00	9.00	10.00	11.00
TOTAL P	PPM	0.07	0.10	0.02	0.07	0.05
NITRATE	PPM	0.30	1.00	1.00	2.00	1.00
POTASSIUM	EPM	0.20	0.26	0.36	0.15	0.18
SODIUM	EPM	19.14	18.49	19.14	17.40	17.40
CALCIUM	EPM	3.59	3.99	2.54	5.49	5.59
MAGNESIUM	EPM	4.61	4.85	4.77	3.54	4.44
SULFATE	EPM	18.26	18.28	18.26	18.03	18.22
CHLORIDE	EPM	0.11	0.23	0.28	0.28	0.45
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.90	9.19	9.29	8.70	9.00
FLOURIDE	EPM	0.03	0.03	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		27.54	27.59	26.81	26.58	27.61
TOTAL ANIONS		27.27	27.67	27.78	26.96	27.57
DEVIATION		99.00	100	104	101	99.86
TDS (calc.)		1727	1736	1729	1696	1734
TDS @180		1694	1739	1697	1559	1777
TOTAL HARDNESS		412	442	366	452	501
ALKALINITY		445	460	465	435	450
NON-CARB HARD		0.00	0.00	0.00	17.00	51.00
LAB CONDUCTIVITY		2273	2200	2500	2400	2300
FIELD COND.						
LAB pH		7.90	7.00	8.20	7.80	7.90
FIELD pH		7.80	8.10	6.80	6.80	

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 8 (SANDSTONE AQUIFER) 2 of 3

DATE		032177	061577	092977	121977
POTASSIUM	PPM	6.00	9.00	13.00	8.00
SODIUM	PPM	420	440	420	412
CALCIUM	PPM	125	47.00	70.00	66.00
MAGNESIUM	PPM	25.00	59.00	58.00	58.00
SULFATE	PPM	883	872	890	871
CHLORIDE	PPM	11.00	14.00	15.00	13.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	549	537	537	512
FLOURIDE	PPM	0.50	0.39	0.41	0.45
SILICON DIO	PPM	11.00	10.00	11.00	11.00
TOTAL P	PPM	0.02	0.07	0.02	0.03
NITRATE	PPM	0.10	0.10	0.20	0.10
POTASSIUM	EPM	0.15	0.23	0.33	0.20
SODIUM	EPM	18.27	19.14	18.27	17.92
CALCIUM	EPM	6.24	2.35	3.49	3.29
MAGNESIUM	EPM	2.06	4.85	4.77	4.77
SULFATE	EPM	18.38	18.16	18.53	18.13
CHLORIDE	EPM	0.31	0.39	0.42	0.37
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.00	8.80	8.80	8.39
FLOURIDE	EPM	0.03	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		26.72	26.57	26.87	26.19
TOTAL ANIONS		27.64	27.27	27.67	26.82
DEVIATION		103	103	103	102
TDS (calc.)		1740	1705	1730	1680
TDS @180		1741	1753	1692	1740
TOTAL HARDNESS		412	361	414	404
ALKALINITY		450	440	440	420
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		2500	2522	2368	2450
FIELD COND.				1740	1600
LAB pH		7.60	7.60	7.70	7.70
FIELD pH		7.20		7.18	7.47

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL RBCW 8 (SANDSTONE AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	9.00	2.71	9.00
SODIUM	PPM	422	15.12	9.00
CALCIUM	PPM	81.44	26.29	9.00
MAGNESIUM	PPM	52.22	10.73	9.00
SULFATE	PPM	877	6.58	9.00
CHLORIDE	PPM	11.22	3.55	9.00
CARBONATE	PPM	0.00	0.00	9.00
BICARBONATE	PPM	543	15.45	9.00
FLOURIDE	PPM	0.44	0.05	9.00
SILICON DIO	PPM	9.89	1.29	9.00
TOTAL P	PPM	0.03	0.05	9.00
NITRATE	PPM	0.04	0.89	9.00
POTASSIUM	EPM	0.23		
SODIUM	EPM	18.35		
CALCIUM	EPM	4.06		
MAGNESIUM	EPM	4.30		
SULFATE	EPM	18.25		
CHLORIDE	EPM	0.32		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	8.90		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		26.94	0.49	9.00
TOTAL ANIONS		27.40	0.32	9.00
DEVIATION		102	1.58	9.00
TDS (calc.)		1720	19.65	9.00
TDS @180		1710	60.18	9.00
TOTAL HARDNESS		418	40.63	9.00
ALKALINITY		445	12.69	9.00
NON-CARB HARD		7.56	16.25	9.00
LAB CONDUCTIVITY		2390	107	9.00
FIELD COND.		1670	70.00	2.00
LAB pH		7.71	0.31	9.00
FIELD pH		7.34	0.45	7.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL RBCW 9 1 of 2

DATE		071276	092876	121476	061677
POTASSIUM	PPM	15.00	18.00	16.00	14.00
SODIUM	PPM	333	300	280	300
CALCIUM	PPM	183	484	264	264
MAGNESIUM	PPM	181	29.00	173	149
SULFATE	PPM	1505	1494	1480	1473
CHLORIDE	PPM	10.00	15.00	23.00	25.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	531	561	543	525
FLOURIDE	PPM	0.40	0.50	0.40	0.44
SILICON DIO	PPM	16.00	18.00	16.00	17.00
TOTAL P	PPM	0.01	0.05	0.09	0.18
NITRATE	PPM	2.00	2.00	7.00	0.10
POTASSIUM	EPM	0.38	0.46	0.41	0.36
SODIUM	EPM	14.49	13.05	12.18	13.05
CALCIUM	EPM	9.13	24.15	13.17	13.17
MAGNESIUM	EPM	14.89	2.39	14.23	12.26
SULFATE	EPM	31.33	31.11	30.81	30.67
CHLORIDE	EPM	0.28	0.42	0.65	0.71
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.70	9.19	8.90	8.60
FLOURIDE	EPM	0.02	0.03	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		38.89	40.05	39.99	38.84
TOTAL ANIONS		40.27	40.64	40.21	39.82
DEVIATION		104	101	101	103
TDS (calc.)		2488	2616	2503	2483
TDS @180		2623	2430	2647	2382
TOTAL HARDNESS		1200	1325	1368	1270
ALKALINITY		435	460	445	430
NON-CARB HARD		765	865	923	840
LAB CONDUCTIVITY		4700	3000	3300	3104
FIELD COND.					
LAB pH		7.60	7.40	7.60	7.60
FIELD pH		6.50	6.40	6.60	

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

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TYPING GUIDE SHEET

CENTER OF PAGE

TOP OF IMAGE AREA

DROPPED HEAD; BEGIN SECTIONS HERE

WELL RBCW 9 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	15.75	1.48	4.00
SODIUM	PPM	303	19.02	4.00
CALCIUM	PPM	299	112	4.00
MAGNESIUM	PPM	133	61.19	4.00
SULFATE	PPM	1488	12.41	4.00
CHLORIDE	PPM	18.25	6.06	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	540	13.75	4.00
FLOURIDE	PPM	0.43	0.04	4.00
SILICON DIO	PPM	16.75	0.83	4.00
TOTAL P	PPM	0.08	0.06	4.00
NITRATE	PPM	2.73	2.61	4.00
POTASSIUM	EPM	0.40		
SODIUM	EPM	13.19		
CALCIUM	EPM	14.91		
MAGNESIUM	EPM	10.94		
SULFATE	EPM	30.98		
CHLORIDE	EPM	0.51		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	8.85		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		39.44	0.58	4.00
TOTAL ANIONS		40.23	0.29	4.00
DEVIATION		102	1.12	4.00
TDS (calc.)		2522	54.48	4.00
TDS @180		2520	116	4.00
TOTAL HARDNESS		1291	62.86	4.00
ALKALINITY		442	11.46	4.00
NON-CARB HARD		848	56.72	4.00
LAB CONDUCTIVITY		3526	686	4.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.55	0.09	4.00
FIELD pH		6.50	0.08	3.00

1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG

Well # NCRP #20
Date Completed 11/26/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0-26	26	Sand, Tan, Fine
26-27	1	Sandstone, Hard
27-48	21	Sandstone, Tan, Gray, Fine
48-49	1	Sandstone, Hard Layer
49-62	13	Sandstone, Fine
62-62.5	.5	Coal, Shale
62.5'-65'	2.5'	Coal (65' water good)
65'-74'	9'	Sandy Shale, Gray
74'-81'	7'	Coal, Black
81'-100'	19'	Sandy Shale, Gray
100-103'	19'	Coal
103'-108'	5'	Shale, Gray, Hard Layer

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP20A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3342

DATE	LEVEL	READING	CHANGE
12 17 1975	3284.94	57.06	00.00
1 28 1976	3285.53	56.47	-00.59
2 13 1976	3285.37	56.63	00.16
3 4 1976	3285.38	56.62	-00.01
3 30 1976	3284.13	57.87	01.25
5 4 1976	3285.02	56.98	-00.89
6 3 1976	3284.54	57.46	00.48
7 8 1976	3284.33	57.67	00.21
7 28 1976	3284.01	57.99	00.32
9 8 1976	3283.70	58.30	00.31
9 28 1976	3283.37	58.63	00.33
10 21 1976	3283.24	58.76	00.13
11 17 1976	3283.08	58.92	00.16
12 13 1976	3283.02	58.98	00.06
2 18 1977	3282.90	59.10	00.12
3 21 1977	3282.90	59.10	00.00
4 25 1977	3283.05	58.95	-00.15
5 24 1977	3283.07	58.93	-00.02
6 16 1977	3284.74	57.26	-01.67
7 28 1977	3282.17	59.83	02.57
8 30 1977	3281.87	60.13	00.30
10 6 1977	3280.80	61.20	01.07
10 21 1977	3281.75	60.25	-00.95
12 19 1977	3283.85	58.15	-02.10
1 24 1978	3284.70	57.30	-00.85
4 12 1978	3282.63	59.37	02.07
7 5 1978	3284.58	57.42	-01.95
9 5 1978	3284.45	57.55	00.13
10 23 1978	3284.27	57.73	00.18
12 8 1978	3285.27	56.73	-01.00
3 11 1979	3286.62	55.38	-01.35
8 9 1979	3285.07	56.93	01.55

6-1/2
8-1/8"
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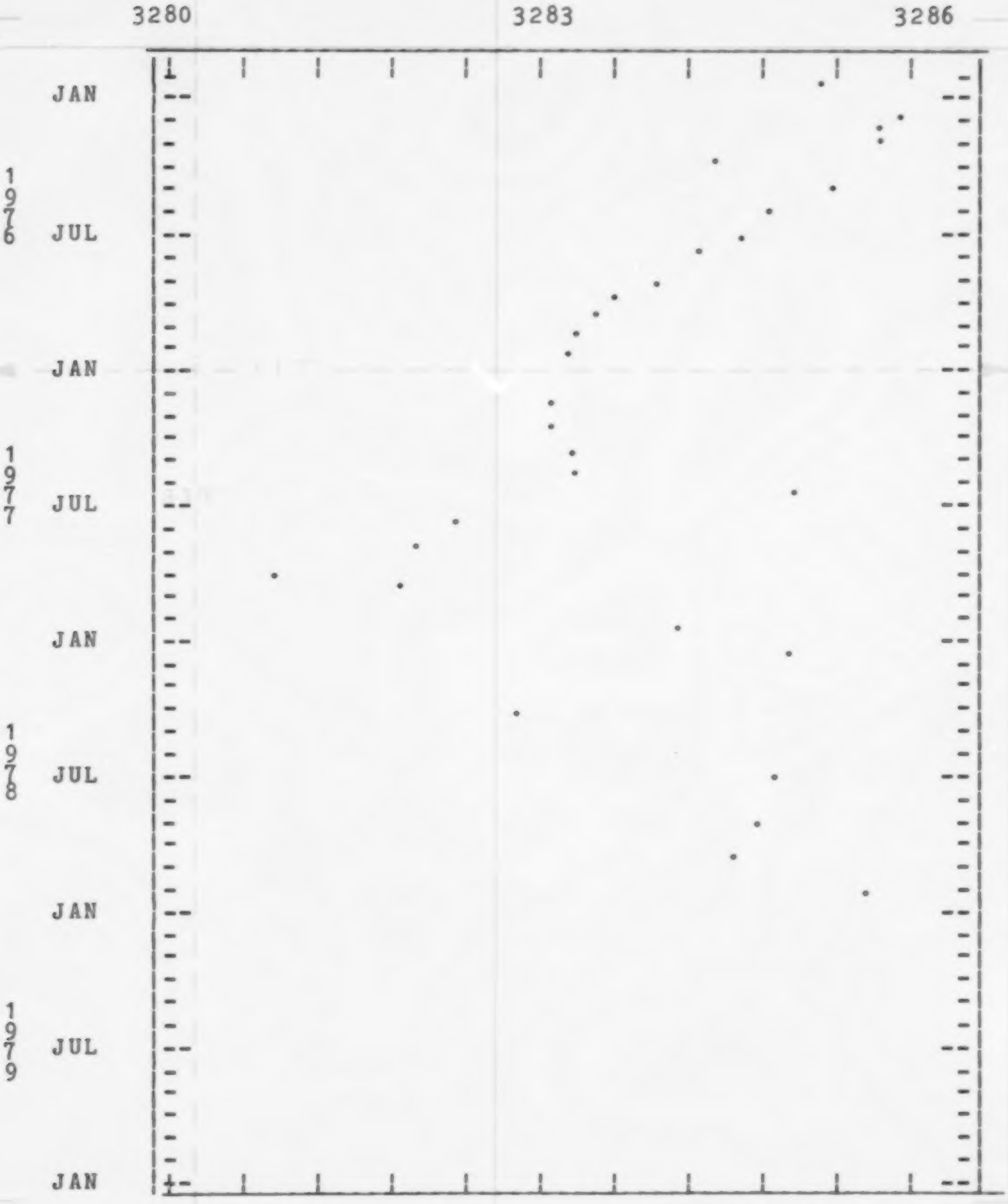
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP20A

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 20A (LOCAL COAL SEAM AQUIFER) 1 of 3

DATE		021676	033076	071276	092876	121376
POTASSIUM	PPM	20.00	10.00	15.00	15.00	12.00
SODIUM	PPM	190	240	277	227	220
CALCIUM	PPM	230	104	93.00	246	246
MAGNESIUM	PPM	2.00	106	95.00	11.00	25.00
SULFATE	PPM	845	775	761	730	728
CHLORIDE	PPM	6.00	8.00	9.00	14.00	15.00
CARBONATE	PPM	12.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	50.00	561	549	464	537
FLOURIDE	PPM	0.60	0.40	0.40	0.40	0.40
SILICON DIO	PPM	19.00	10.00	11.00	12.00	10.00
TOTAL P	PPM	0.15	0.10	0.08	0.01	0.02
NITRATE	PPM	1.00	1.00	1.00	1.00	2.00
POTASSIUM	EPM	0.51	0.26	0.38	0.38	0.31
SODIUM	EPM	8.26	10.44	12.05	9.87	9.57
CALCIUM	EPM	11.48	5.19	4.64	12.28	12.28
MAGNESIUM	EPM	0.16	8.72	7.81	0.90	2.06
SULFATE	EPM	17.59	16.14	15.84	15.20	15.16
CHLORIDE	EPM	0.17	0.23	0.25	0.39	0.42
CARBONATE	EPM	0.40	0.00	0.00	0.00	0.00
BICARBONATE	EPM	0.82	9.19	9.00	7.60	8.80
FLOURIDE	EPM	0.03	0.02	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		20.42	24.60	24.89	23.44	24.21
TOTAL ANIONS		18.97	25.52	25.05	23.12	24.29
DEVIATION		92.91	104	101	98.62	100
TDS (calc.)		1305	1519	1520	1471	1510
TDS @180		1421	1543	1480	1515	1543
TOTAL HARDNESS		582	694	622	658	717
ALKALINITY		135	460	450	380	440
NON-CARB HARD		447	234	172	278	277
LAB CONDUCTIVITY		2200	2000	2200	1800	1900
FIELD COND.						
LAB pH			7.80	7.80	7.40	7.70
FIELD pH			6.70	6.60	6.50	6.70

EPA-287 (Cin.)
(4-76)

WELL NCRP 20A (LOCAL COAL SEAM AQUIFER) 2 of 3

DATE		032177	061677	102177	121977
POTASSIUM	PPM	12.00	37.00	11.00	2.00
SODIUM	PPM	240	170	240	230
CALCIUM	PPM	160	91.00	105	117
MAGNESIUM	PPM	75.00	26.00	114	107
SULFATE	PPM	731	663	750	770
CHLORIDE	PPM	10.00	10.00	13.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	525	44.00	549	537
FLOURIDE	PPM	0.50	0.50	0.32	0.41
SILICON DIO	PPM	12.00	6.00	12.00	14.00
TOTAL P	PPM	0.01	0.02	0.01	0.24
NITRATE	PPM	0.30	0.10	0.60	0.30
POTASSIUM	EPM	0.31	0.95	0.28	0.05
SODIUM	EPM	10.44	7.39	10.44	10.00
CALCIUM	EPM	7.98	4.54	5.24	5.84
MAGNESIUM	EPM	6.17	2.14	9.38	8.80
SULFATE	EPM	15.22	13.80	15.61	16.03
CHLORIDE	EPM	0.28	0.28	0.37	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.60	0.72	9.00	8.80
FLOURIDE	EPM	0.03	0.03	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		24.90	15.02	25.34	24.70
TOTAL ANIONS		24.06	14.76	24.90	25.09
DEVIATION		96.62	98.26	98.27	102
TDS (calc.)		1486	1019	1503	1511
TDS @180		1501	1047	1551	1528
TOTAL HARDNESS		706	333	731	731
ALKALINITY		430	36.00	450	440
NON-CARB HARD		276	297	281	291
LAB CONDUCTIVITY		2100	1474	2352	2058
FIELD COND.				1490	1370
LAB pH		7.80	7.70	7.50	7.70
FIELD pH		6.90			7.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 20A (LOCAL COAL SEAM AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	14.89	9.05	9.00
SODIUM	PPM	226	29.20	9.00
CALCIUM	PPM	155	63.85	9.00
MAGNESIUM	PPM	62.33	43.19	9.00
SULFATE	PPM	750	45.93	9.00
CHLORIDE	PPM	10.67	2.75	9.00
CARBONATE	PPM	1.33	3.77	9.00
BICARBONATE	PPM	424	203	9.00
FLOURIDE	PPM	0.44	0.08	9.00
SILICON DIO	PPM	11.78	3.29	9.00
TOTAL P	PPM	0.04	0.09	9.00
NITRATE	PPM	0.37	0.90	9.00
POTASSIUM	EPM	0.38		
SODIUM	EPM	9.83		
CALCIUM	EPM	7.72		
MAGNESIUM	EPM	5.13		
SULFATE	EPM	15.62		
CHLORIDE	EPM	0.30		
CARBONATE	EPM	0.04		
BICARBONATE	EPM	6.95		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		23.06	3.16	9.00
TOTAL ANIONS		22.86	3.42	9.00
DEVIATION		99.00	2.93	9.00
TDS (calc.)		1427	158	9.00
TDS @180		1459	151	9.00
TOTAL HARDNESS		642	119	9.00
ALKALINITY		358	149	9.00
NON-CARB HARD		284	68.30	9.00
LAB CONDUCTIVITY		2009	246	9.00
FIELD COND.		1430	60.00	2.00
LAB pH		7.67	0.14	8.00
FIELD pH		6.73	0.17	6.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP20B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3342

DATE	LEVEL	READING	CHANGE
12 17 1975	3288.76	53.24	00.00
1 28 1976	3288.78	53.22	-00.02
2 13 1976	3288.80	53.20	-00.02
3 4 1976	3288.77	53.23	00.03
3 30 1976	3288.65	53.35	00.12
5 4 1976	3288.31	53.69	00.34
6 3 1976	3288.01	53.99	00.30
7 8 1976	3287.78	54.22	00.23
7 28 1976	3287.56	54.44	00.22
9 8 1976	3287.10	54.90	00.46
9 28 1976	3286.41	55.59	00.69
10 21 1976	3286.50	55.50	-00.09
11 17 1976	3286.11	55.89	00.39
12 13 1976	3286.04	55.96	00.07
2 18 1977	3285.74	56.26	00.30
3 21 1977	3285.10	56.90	00.64
4 25 1977	3285.06	56.94	00.04
5 24 1977	3284.98	57.02	00.08
6 16 1977	3282.63	59.37	02.35
7 28 1977	3284.41	57.59	-01.78
8 30 1977	3284.17	57.83	00.24
10 21 1977	3283.94	58.06	00.23
12 19 1977	3283.57	58.43	00.37
1 24 1978	3283.71	58.29	-00.14
3 8 1978	3281.62	60.38	02.09
4 12 1978	3284.05	57.95	-02.43
7 5 1978	3284.44	57.56	-00.39
9 5 1978	3286.42	55.58	-01.98
10 23 1978	3287.92	54.08	-01.50
12 8 1978	3287.72	54.28	00.20
3 11 1979	3287.75	54.25	-00.03
8 9 1979	3286.51	55.49	01.24

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 20B (LOCAL COAL SEAM AQUIFER) 1 of 2

DATE		021676	033076	121376	032177	061677
POTASSIUM	PPM	26.00	11.00	17.00	34.00	12.00
SODIUM	PPM	165	180	188	180	220
CALCIUM	PPM	241	146	90.00	86.00	150
MAGNESIUM	PPM	8.00	20.00	19.00	28.00	77.00
SULFATE	PPM	909	775	683	674	701
CHLORIDE	PPM	9.00	6.00	13.00	10.00	12.00
CARBONATE	PPM	11.00	24.00	5.00	0.00	0.00
BICARBONATE	PPM	15.00	37.00	7.00	61.00	488
FLOURIDE	PPM	0.40	0.40	0.20	2.00	0.20
SILICON DIO	PPM	15.00	14.00	1.00	4.00	12.00
TOTAL P	PPM	0.06	0.10	0.07	0.01	0.19
NITRATE	PPM	1.00	2.00	1.00	0.10	0.50
POTASSIUM	EPM	0.66	0.28	0.43	0.87	0.31
SODIUM	EPM	7.18	7.83	8.18	7.83	9.57
CALCIUM	EPM	12.03	7.29	4.49	4.29	7.48
MAGNESIUM	EPM	0.66	1.65	1.56	2.30	6.33
SULFATE	EPM	18.93	16.14	14.22	14.03	14.59
CHLORIDE	EPM	0.25	0.17	0.37	0.28	0.34
CARBONATE	EPM	0.37	0.80	0.17	0.00	0.00
BICARBONATE	EPM	0.25	0.61	0.11	1.00	8.00
FLOURIDE	EPM	0.02	0.02	0.01	0.11	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		20.53	17.04	14.67	15.29	23.70
TOTAL ANIONS		19.75	17.69	14.78	15.35	22.86
DEVIATION		96.20	104	101	100	96.46
TDS (calc.)		1723	1180	1019	1042	1412
TDS @180		1419	1182	1006	1020	1456
TOTAL HARDNESS		637	449	303	329	689
ALKALINITY		34.00	70.00	14.00	50.00	400
NON-CARB HARD		603	379	289	279	289
LAB CONDUCTIVITY		2000	1600	1360	1490	2037
FIELD COND.						
LAB pH			8.80	9.00	7.60	7.60
FIELD pH			8.70		8.50	

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9-1/8"
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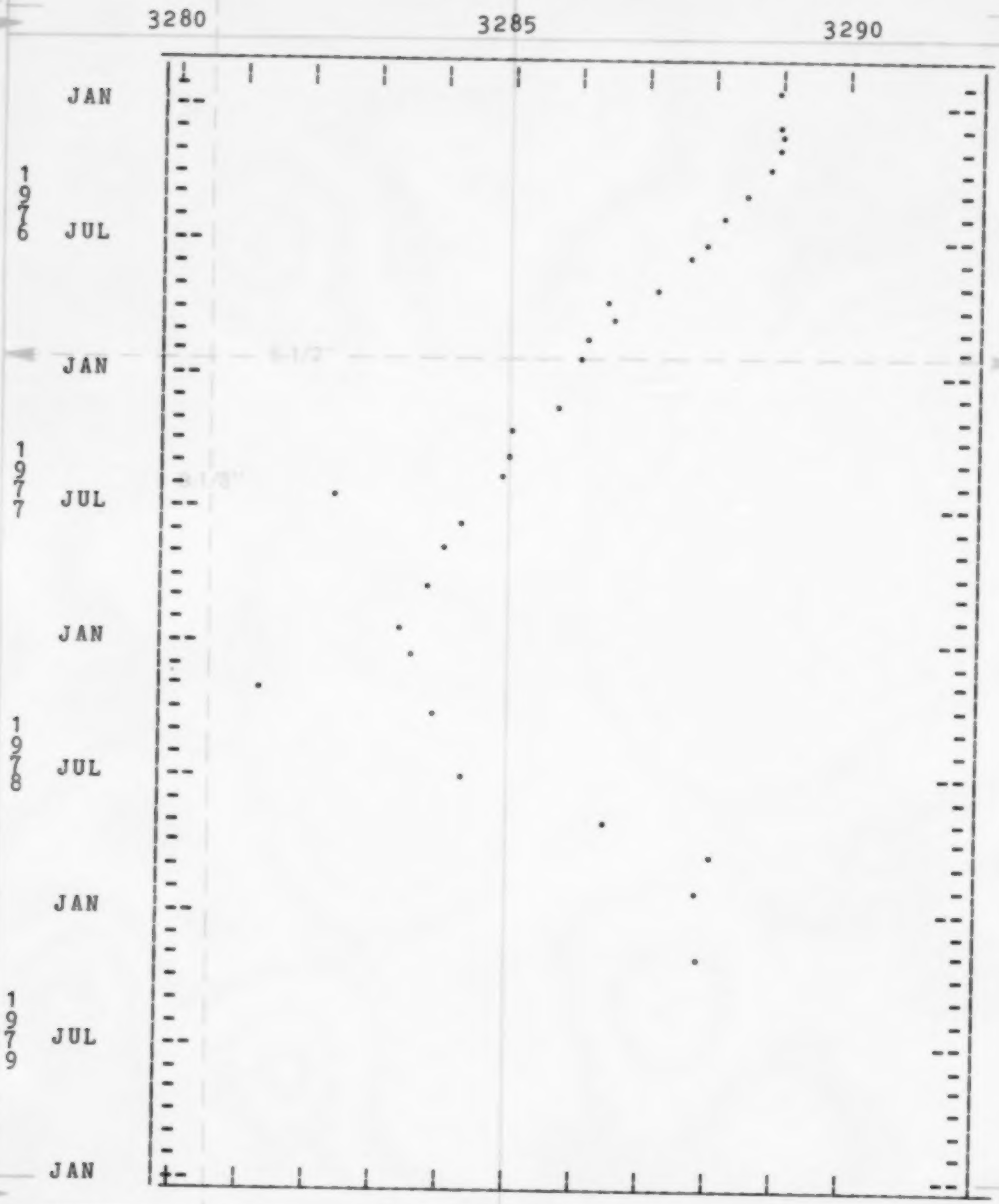
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP20B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 20B (LOCAL COAL SEAM AQUIFER) 2 of 2

DATE		102177	121977	MEAN	ST.DEV	#
POTASSIUM	PPM	29.00	16.00	20.71	8.28	7.00
SODIUM	PPM	180	172	184	16.32	7.00
CALCIUM	PPM	89.00	113	131	51.38	7.00
MAGNESIUM	PPM	40.00	117	44.14	36.23	7.00
SULFATE	PPM	693	749	741	76.72	7.00
CHLORIDE	PPM	11.00	12.00	10.43	2.19	7.00
CARBONATE	PPM	0.00	0.00	5.71	8.40	7.00
BICARBONATE	PPM	78.00	464	164	199	7.00
FLOURIDE	PPM	0.18	0.50	0.55	0.60	7.00
SILICON DIO	PPM	7.00	19.00	10.00	6.46	7.00
TOTAL P	PPM	0.01	0.11	0.05	0.09	7.00
NITRATE	PPM	1.00	0.10	0.50	0.89	7.00
POTASSIUM	EPM	0.74	0.41	0.53		
SODIUM	EPM	7.83	7.48	7.99		
CALCIUM	EPM	4.44	5.64	6.52		
MAGNESIUM	EPM	3.29	9.62	3.63		
SULFATE	EPM	14.43	15.59	15.42		
CHLORIDE	EPM	0.31	0.34	0.29		
CARBONATE	EPM	0.00	0.00	0.19		
BICARBONATE	EPM	1.28	7.60	2.69		
FLOURIDE	EPM	0.01	0.03	0.03		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		16.30	23.15	18.67	3.47	7.00
TOTAL ANIONS		15.94	23.48	18.55	3.30	7.00
DEVIATION		97.80	101	99.54	2.60	7.00
TDS (calc.)		1080	1407	1266	240	7.00
TDS @180		1094	1435	1230	187	7.00
TOTAL HARDNESS		386	760	508	171	7.00
ALKALINITY		64.00	380	145	156	7.00
NON-CARB HARD		322	380	363	105	7.00
LAB CONDUCTIVITY		1411	1813	1673	258	7.00
FIELD COND.		1150	1190	1170	20.00	2.00
LAB pH		7.70	7.90	8.10	0.58	6.00
FIELD pH			8.23	8.48	0.19	3.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
9-1/8"
1/2"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

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TYPING GUIDE SHEET

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TOP OF IMAGE AREA

DROPPED HEAD; BEGIN SECTIONS HERE

1 of 1

WELL USGS3

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3189

DATE	LEVEL	READING	CHANGE
12 17 1975	3180.65	8.35	00.00
1 28 1976	3180.80	8.20	-00.15
3 4 1976	3181.13	7.87	-00.33
3 31 1976	3181.24	7.76	-00.11
5 4 1976	3181.17	7.83	00.07
6 3 1976	3180.92	8.08	00.25
7 8 1976	3181.42	7.58	-00.50
7 12 1976	3181.42	7.58	00.00
7 28 1976	3180.31	8.69	01.11
9 8 1976	3180.04	8.96	00.27
9 28 1976	3180.00	9.00	00.04
10 21 1976	3180.11	8.89	-00.11
11 17 1976	3180.15	8.85	-00.04
12 14 1976	3180.22	8.78	-00.07
1 18 1977	3180.55	8.45	-00.33
2 18 1977	3180.39	8.61	00.16
3 23 1977	3180.42	8.58	-00.03
4 25 1977	3180.92	8.08	-00.50
5 24 1977	3180.96	8.04	-00.04
6 16 1977	3180.76	8.24	00.20
7 28 1977	3179.94	9.06	00.82
8 30 1977	3179.67	9.33	00.27
9 29 1977	3179.89	9.11	-00.22
12 20 1977	3180.16	8.84	-00.27
1 19 1978	3180.39	8.61	-00.23
3 8 1978	3180.38	8.62	00.01
7 7 1978	3182.10	6.90	-01.72
8 11 1978	3181.12	7.88	00.98
9 5 1978	3180.90	8.10	00.22
10 23 1978	3180.80	8.20	00.10
12 8 1978	3180.83	8.17	-00.03
3 13 1979	3181.56	7.44	-00.73
4 18 1979	3182.00	7.00	-00.44
5 21 1979	3181.96	7.04	00.04
6 13 1979	3181.52	7.48	00.44
7 20 1979	3180.69	8.31	00.83
8 9 1979	3180.48	8.52	00.21

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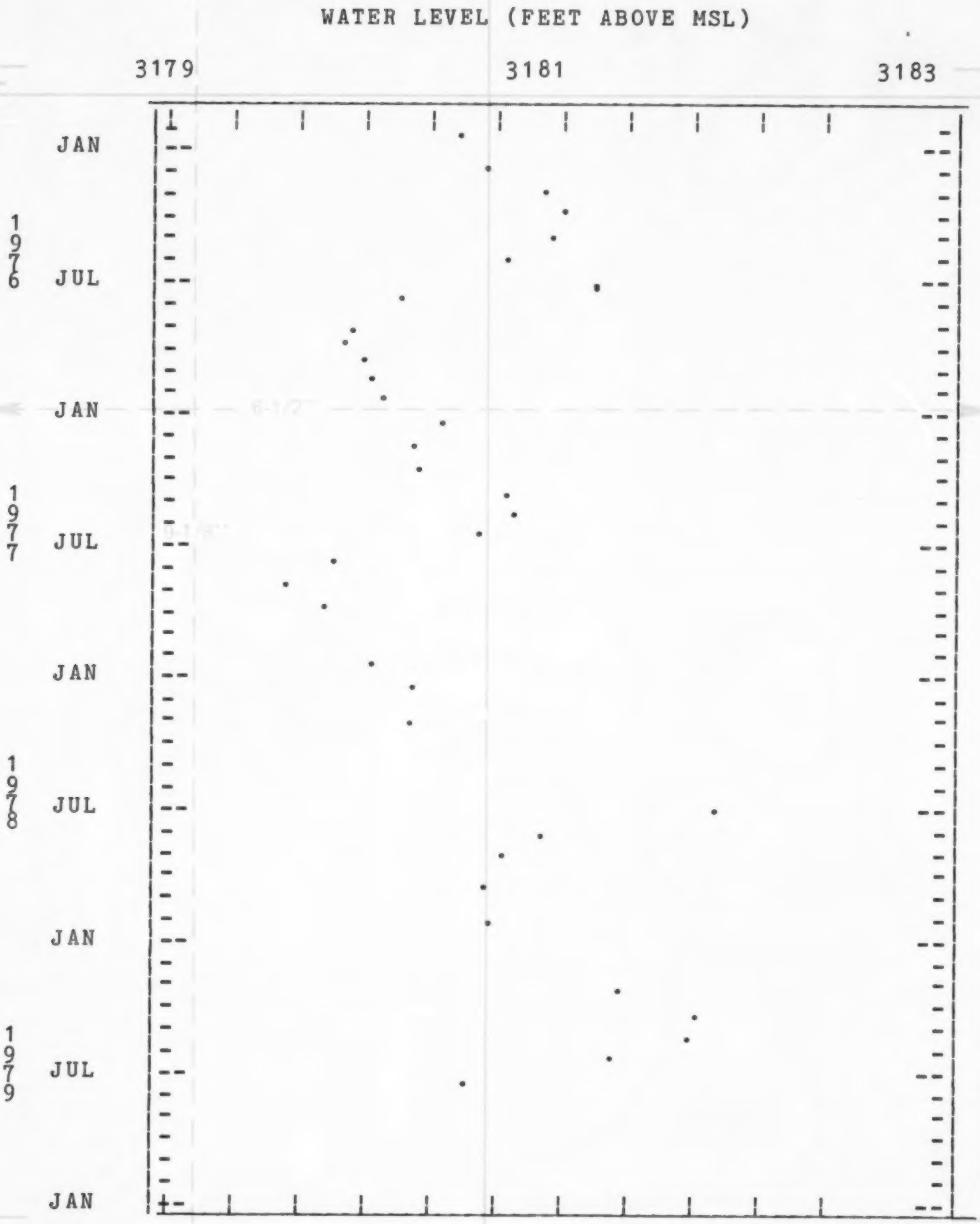
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

HYDROGRAPH FOR WELL USGS3



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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #15
Date Completed 4/16/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-5'	5'	Sandy Clay, Brown
5'-10'	5'	Gravel
10'-2'	10'	Gravel, H_2O
20'-25'	5'	Gravel
25'-36'	11'	Sandy Gravel
36'-39'	3'	Brown Clay
39'-45'	6'	Gravel
45'-57'	12'	Sandy Gravel
57'-65'	8'	Gray Sandstone
65'-76'	11'	Gray, Sandy Clay
76'-78'	2'	Gray Shale, Coal Streak H_2O

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

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TOP OF IMAGE AREA

1 of 1

WELL NCRP15A

GROUNDWATER LEVELS (FEET--DATUM MSL)

DROPPED HEAD; BEGIN SECTIONS HERE

elevation at top of well casing is 3775

DATE	LEVEL	READING	CHANGE
6 9 1976	3765.76	9.24	00.00
7 8 1976	3765.90	9.10	-00.14
7 28 1976	3764.76	10.24	01.14
9 8 1976	3764.07	10.93	00.69
9 23 1976	3764.02	10.98	00.05
10 21 1976	3764.34	10.66	-00.32
11 7 1976	3764.51	10.49	-00.17
1 11 1977	3764.81	10.19	-00.30
1 18 1977	3764.82	10.18	-00.01
2 17 1977	3764.95	10.05	-00.13
3 21 1977	3765.42	9.58	-00.47
4 25 1977	3766.48	8.52	-01.06
5 24 1977	3766.30	8.70	00.18
6 15 1977	3765.54	9.46	00.76
7 28 1977	3764.40	10.60	01.14
8 30 1977	3765.06	9.94	-00.66
10 6 1977	3763.97	11.03	01.09
10 28 1977	3764.30	10.70	-00.33
12 21 1977	3764.68	10.32	-00.38
1 19 1978	3764.82	10.18	-00.14
3 8 1978	3764.92	10.08	-00.10
4 5 1978	3766.36	8.64	-01.44
7 7 1978	3767.85	7.15	-01.49
8 11 1978	3766.82	8.18	01.03
9 5 1978	3766.38	8.62	00.44
10 19 1978	3766.80	8.20	-00.42
12 8 1978	3767.03	7.97	-00.23
2 28 1979	3767.25	7.75	-00.22
3 14 1979	3768.40	6.60	-01.15
4 10 1979	3766.23	8.77	02.17
4 18 1979	3768.59	6.41	-02.36
5 21 1979	3768.18	6.82	00.41
6 5 1979	3767.47	7.53	00.71
7 17 1979	3766.53	8.47	00.94
7 20 1979	3766.46	8.54	00.07
8 9 1979	3766.20	8.80	00.26

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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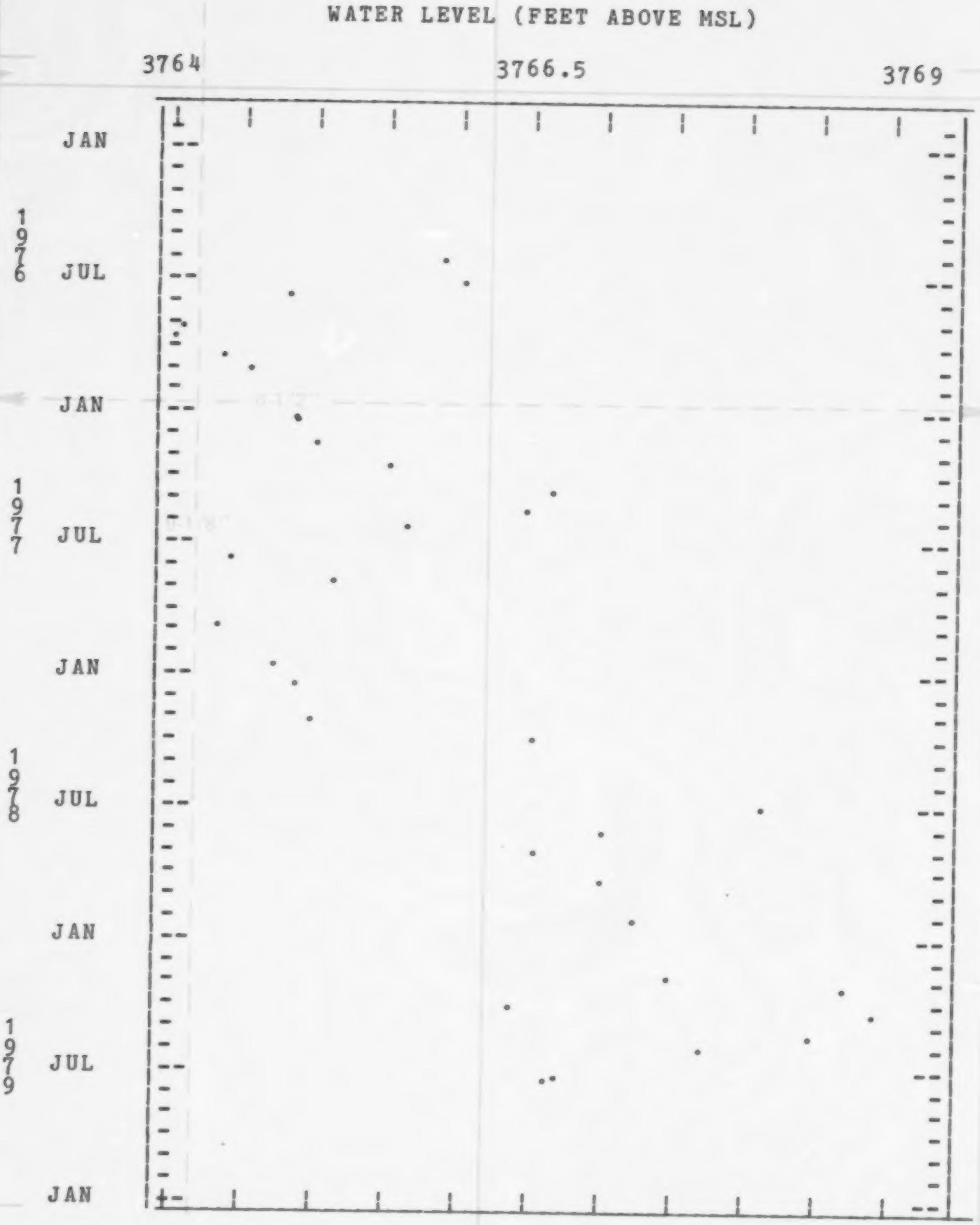
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP15A



EPA-287 (Cin.)
(4-78)

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TOP OF IMAGE AREA

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WELL NCRP 15A   1 of 2

DATE		071276	032177	061577	122177
POTASSIUM	PPM	10.00	13.00	14.00	14.00
SODIUM	PPM	207	220	230	200
CALCIUM	PPM	44.00	88.00	65.00	54.00
MAGNESIUM	PPM	60.00	26.00	34.00	55.00
SULFATE	PPM	351	297	321	305
CHLORIDE	PPM	6.00	6.00	9.00	9.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	561	598	561	586
FLOURIDE	PPM	0.70	0.80	0.58	0.86
SILICON DIO	PPM	12.00	15.00	13.00	21.00
TOTAL P	PPM	0.17	0.21	0.36	0.26
NITRATE	PPM	2.00	0.10	0.10	0.10
POTASSIUM	EPM	0.26	0.33	0.36	0.36
SODIUM	EPM	9.00	9.57	10.00	8.70
CALCIUM	EPM	2.20	4.39	3.24	2.69
MAGNESIUM	EPM	4.94	2.14	2.80	4.52
SULFATE	EPM	7.31	6.18	6.68	6.35
CHLORIDE	EPM	0.17	0.17	0.25	0.25
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.19	9.80	9.19	9.60
FLOURIDE	EPM	0.04	0.04	0.03	0.05
NITRATE	EPM	0.00	0.00	0.01	0.00
TOTAL CATIONS		16.39	16.43	16.40	16.28
TOTAL ANIONS		16.67	16.16	16.10	16.19
DEVIATION		102	98.31	98.16	99.47
TDS (calc.)		954	944	949	925
TDS @180		929	966	969	957
TOTAL HARDNESS		356	325	303	361
ALKALINITY		460	490	460	480
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1600	1520	1465	1372
FIELD COND.					940
LAB pH		8.10	8.00	7.70	8.20
FIELD pH		7.00	7.40		8.10

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL NCRP 15A 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	12.75	1.64	4.00
SODIUM	PPM	214	11.58	4.00
CALCIUM	PPM	62.75	16.36	4.00
MAGNESIUM	PPM	43.75	14.15	4.00
SULFATE	PPM	318	20.66	4.00
CHLORIDE	PPM	7.50	1.50	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	576	16.07	4.00
FLOURIDE	PPM	0.73	0.11	4.00
SILICON DIO	PPM	15.25	3.49	4.00
TOTAL P	PPM	0.25	0.07	4.00
NITRATE	PPM	0.47	0.88	4.00
POTASSIUM	EPM	0.33		
SODIUM	EPM	9.32		
CALCIUM	EPM	3.13		
MAGNESIUM	EPM	3.60		
SULFATE	EPM	6.63		
CHLORIDE	EPM	0.21		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	9.45		
FLOURIDE	EPM	0.04		
NITRATE	EPM	0.00		
TOTAL CATIONS		16.38	0.06	4.00
TOTAL ANIONS		16.28	0.23	4.00
DEVIATION		99.41	1.41	4.00
TDS (calc.)		943	10.98	4.00
TDS @180		955	15.79	4.00
TOTAL HARDNESS		336	23.64	4.00
ALKALINITY		472	12.99	4.00
NON-CARB HARD		0.00	0.00	4.00
LAB CONDUCTIVITY		1489	82.98	4.00
FIELD COND.		940	0.00	1.00
LAB pH		8.00	0.19	4.00
FIELD pH		7.50	0.45	3.00

1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP15B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3775

DATE	LEVEL	READING	CHANGE
6 9 1976	3765.82	9.18	00.00
7 8 1976	3766.82	8.18	-01.00
7 28 1976	3766.10	8.90	00.72
9 8 1976	3765.50	9.50	00.60
9 23 1976	3765.35	9.65	00.15
10 21 1976	3765.51	9.49	-00.16
11 7 1976	3765.78	9.22	-00.27
1 11 1977	3766.20	8.80	-00.42
1 18 1977	3766.15	8.85	00.05
2 17 1977	3766.20	8.80	-00.05
3 21 1977	3766.76	8.24	-00.56
4 25 1977	3767.92	7.08	-01.16
5 24 1977	3767.61	7.39	00.31
6 15 1977	3766.89	8.11	00.72
7 28 1977	3765.84	9.16	01.05
8 30 1977	3765.24	9.76	00.60
10 6 1977	3765.39	9.61	-00.15
10 28 1977	3765.52	9.48	-00.13
12 21 1977	3765.94	9.06	-00.42
1 19 1978	3766.26	8.74	-00.32
3 8 1978	3766.26	8.74	00.00
4 5 1978	3767.62	7.38	-01.36
7 7 1978	3766.71	8.29	00.91
8 11 1978	3765.70	9.30	01.01
9 5 1978	3765.25	9.75	00.45
10 19 1978	3765.70	9.30	-00.45
12 8 1978	3765.95	9.05	-00.25
2 28 1979	3766.22	8.78	-00.27
3 14 1979	3767.20	7.80	-00.98
4 10 1979	3767.17	7.83	00.03
4 18 1979	3767.49	7.51	-00.32
5 21 1979	3767.10	7.90	00.39
6 15 1979	3766.35	8.65	00.75
7 17 1979	3765.37	9.63	00.98
7 20 1979	3765.21	9.79	00.16
8 9 1979	3764.98	10.02	00.23

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

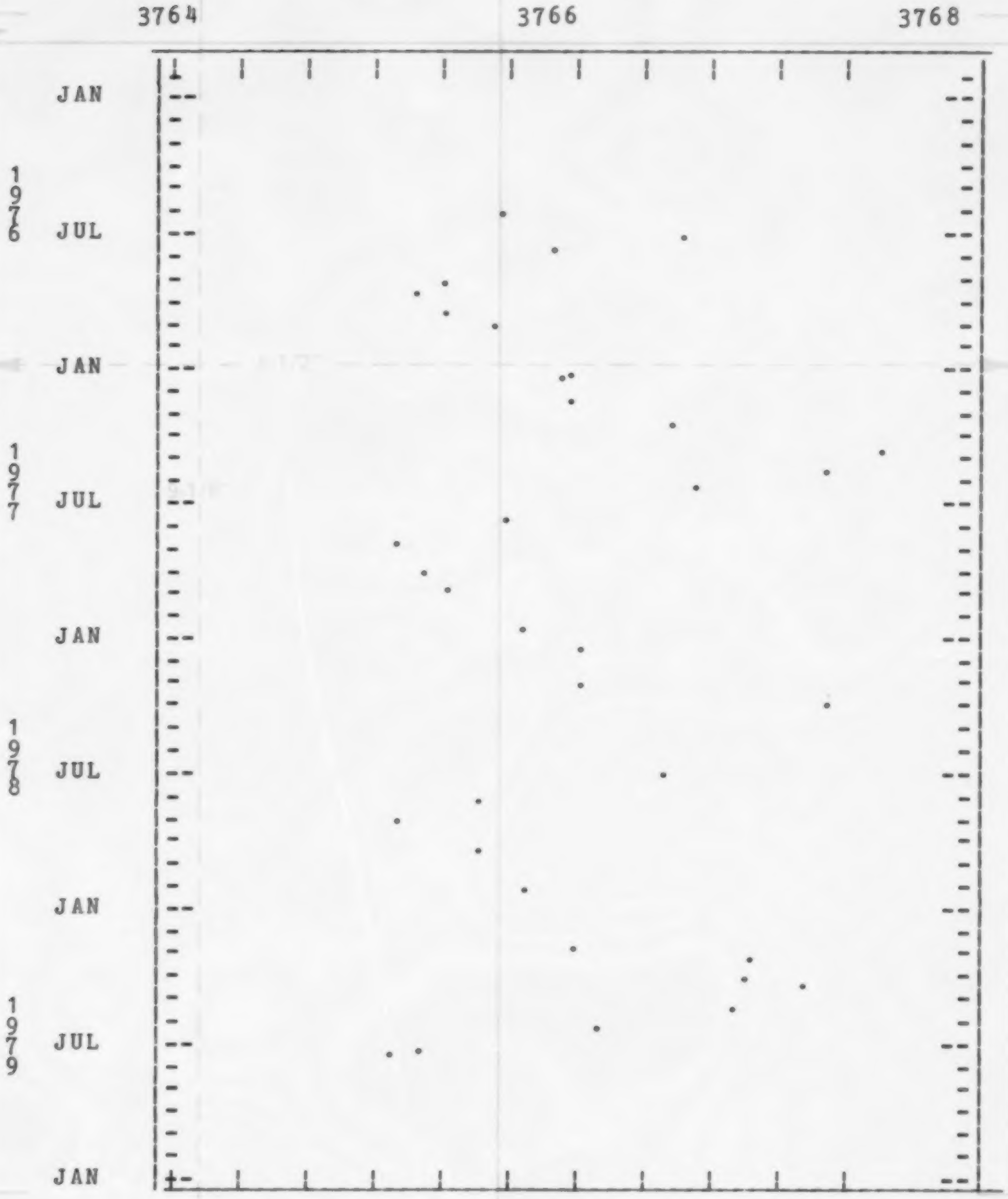
3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP15B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cinn.)
(4-78)

WELL NCRP 15B (UNCONSOLIDATED AQUIFER)   1 of 2

DATE		071276	092376	011177	032177	061577
POTASSIUM	PPM	18.00	15.00	47.00	33.00	33.00
SODIUM	PPM	133	107	100.00	100.00	100.00
CALCIUM	PPM	54.00	232	128	131	108
MAGNESIUM	PPM	98.00	13.00	86.00	49.00	76.00
SULFATE	PPM	361	388	374	281	305
CHLORIDE	PPM	11.00	14.00	10.00	9.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	598	610	695	549	580
FLOURIDE	PPM	1.00	0.10	1.30	1.22	1.10
SILICON DIO	PPM	19.00	34.00	31.00	24.00	25.00
TOTAL P	PPM	0.05	0.05	0.30	0.43	0.22
NITRATE	PPM	4.00	13.00	2.00	0.10	0.40
POTASSIUM	EPM	0.46	0.38	1.20	0.84	0.84
SODIUM	EPM	5.79	4.65	4.35	4.35	4.35
CALCIUM	EPM	2.69	11.58	6.39	6.54	5.39
MAGNESIUM	EPM	8.06	1.07	7.07	4.03	6.25
SULFATE	EPM	7.52	8.08	7.79	5.85	6.35
CHLORIDE	EPM	0.31	0.39	0.28	0.25	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.80	10.00	11.39	9.00	9.51
FLOURIDE	EPM	0.05	0.01	0.07	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.01	0.00
TOTAL CATIONS		17.00	17.68	19.01	15.76	16.83
TOTAL ANIONS		17.60	18.37	19.46	15.11	16.15
DEVIATION		104	104	102	95.85	95.91
TDS (calc.)		969	1069	1087	873	918
TDS @180			1168	1088	884	953
TOTAL HARDNESS		539	633	674	528	581
ALKALINITY		490	500	570	450	475
NON-CARB HARD		49.00	133	104	78.00	106
LAB CONDUCTIVITY		1500	1400	1590	1380	1445
FIELD COND.						
LAB pH		8.10	7.50	7.80	7.90	7.70
FIELD pH		7.30	7.50	7.40	7.30	

EPA-287 (Cin.)
(4-76)

WELL NCRP 15B (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		122177	MEAN	ST.DEV	#
POTASSIUM	PPM	32.00	29.67	10.64	6.00
SODIUM	PPM	120	110	12.50	6.00
CALCIUM	PPM	115	128	53.03	6.00
MAGNESIUM	PPM	79.00	66.83	28.25	6.00
SULFATE	PPM	360	345	38.44	6.00
CHLORIDE	PPM	11.00	11.00	1.53	6.00
CARBONATE	PPM	0.00	0.00	0.00	6.00
BICARBONATE	PPM	647	613	47.08	6.00
FLOURIDE	PPM	1.20	0.99	0.41	6.00
SILICON DIO	PPM	25.00	26.33	4.89	6.00
TOTAL P	PPM	0.26	0.22	0.14	6.00
NITRATE	PPM	0.26	3.26	4.57	6.00
POTASSIUM	EPM	0.82	0.76		
SODIUM	EPM	5.22	4.78		
CALCIUM	EPM	5.74	6.39		
MAGNESIUM	EPM	6.50	5.50		
SULFATE	EPM	7.50	7.18		
CHLORIDE	EPM	0.31	0.31		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	10.60	10.05		
FLOURIDE	EPM	0.06	0.05		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		18.28	17.43	1.05	6.00
TOTAL ANIONS		18.40	17.51	1.47	6.00
DEVIATION		101	100	3.33	6.00
TDS (calc.)		1035	992	78.50	6.00
TDS @180		996	1018	100	5.00
TOTAL HARDNESS		611	594	51.25	6.00
ALKALINITY		530	502	38.70	6.00
NON-CARB HARD		81.00	91.83	26.42	6.00
LAB CONDUCTIVITY		1480	1466	69.43	6.00
FIELD COND.		990	990	0.00	1.00
LAB pH		8.00	7.83	0.20	6.00
FIELD pH			7.37	0.08	4.00

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

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1 of 1

WELL MCW1

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3690

DATE	LEVEL	READING	CHANGE
1 13 1976	3644.44	45.56	00.00
3 1 1976	3645.12	44.88	-00.68
3 31 1976	3645.78	44.22	-00.66
4 26 1976	3645.49	44.51	00.29
5 26 1976	3645.58	44.42	-00.09
6 24 1976	3645.79	44.21	-00.21
7 29 1976	3644.25	45.75	01.54
9 7 1976	3644.78	45.22	-00.53
9 21 1976	3644.32	45.68	00.46
10 26 1976	3644.60	45.40	-00.28
11 15 1976	3643.24	46.76	01.36
12 15 1976	3644.28	45.72	-01.04
1 24 1977	3644.27	45.73	00.01
2 18 1977	3643.92	46.08	00.35
3 15 1977	3643.60	46.40	00.32
4 21 1977	3650.25	39.75	-06.65
5 23 1977	3648.30	41.70	01.95
6 14 1977	3646.72	43.28	01.58
7 22 1977	3645.62	44.38	01.10
8 31 1977	3643.51	46.49	02.11
9 29 1977	3644.95	45.05	-01.44
1 11 1978	3645.26	44.74	-00.31
1 24 1978	3645.42	44.58	-00.16
3 1 1978	3645.15	44.85	00.27
4 12 1978	3648.22	41.78	-03.07
7 7 1978	3663.50	26.50	-15.28
9 6 1978	3657.70	32.30	05.80
10 23 1978	3653.92	36.08	03.78
1 15 1979	3645.22	44.78	08.70
3 1 1979	3648.26	41.74	-03.04
3 21 1979	3646.96	43.04	01.30
5 10 1979	3655.86	34.14	-08.90
6 13 1979	3653.58	36.42	02.28
7 27 1979	3654.35	35.65	-00.77
8 15 1979	3651.88	38.12	02.47

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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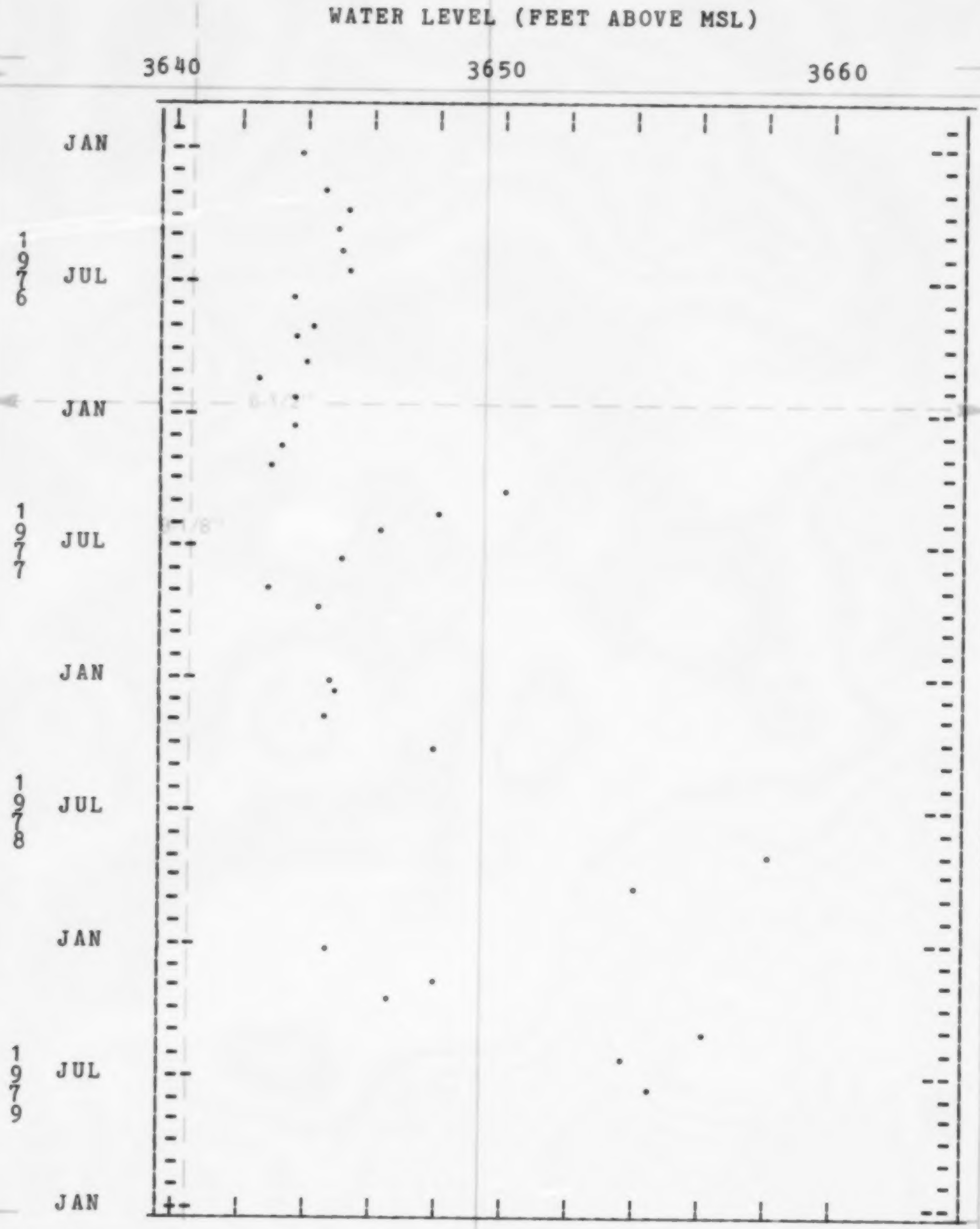
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL MCW1



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL MCW 1 (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		011476	033176	062476	092176	121476
POTASSIUM	PPM	8.00	9.00	9.00	8.00	6.00
SODIUM	PPM	160	159	135	155	112
CALCIUM	PPM	87.00	100.00	85.00	242	219
MAGNESIUM	PPM	103	94.00	104	13.00	29.00
SULFATE	PPM	442	430	428	443	313
CHLORIDE	PPM	8.00	7.00	7.00	11.00	15.00
CARBONATE	PPM	0.00	0.00	12.00	0.00	0.00
BICARBONATE	PPM	653	647	622	671	650
FLOURIDE	PPM	0.60	0.50	0.40	0.50	0.50
SILICON DIO	PPM	12.00	15.00	13.00	14.00	13.00
TOTAL P	PPM	0.11	0.10	0.04	0.01	0.06
NITRATE	PPM	0.30	1.00	1.00	4.00	1.00
POTASSIUM	EPM	0.20	0.23	0.23	0.20	0.15
SODIUM	EPM	6.96	6.92	5.87	6.74	4.87
CALCIUM	EPM	4.34	4.99	4.24	12.08	10.93
MAGNESIUM	EPM	8.47	7.73	8.56	1.07	2.39
SULFATE	EPM	9.20	8.95	8.91	9.22	6.52
CHLORIDE	EPM	0.23	0.20	0.20	0.31	0.42
CARBONATE	EPM	0.00	0.00	0.40	0.00	0.00
BICARBONATE	EPM	10.70	10.60	10.19	11.00	10.65
FLOURIDE	EPM	0.03	0.03	0.02	0.03	0.03
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		19.98	19.87	18.90	20.09	18.34
TOTAL ANIONS		20.10	19.73	19.67	20.48	17.51
DEVIATION		101	99.29	104	102	95.48
TDS (calc.)		1129	1117	1086	1202	1014
TDS @180		1148	1094	1092	1140	1124
TOTAL HARDNESS		642	635	639	658	664
ALKALINITY		535	530	530	550	533
NON-CARB HARD		107	105	109	108	131
LAB CONDUCTIVITY		1600	1600	1900	1754	1500
FIELD COND.						
LAB pH		7.40	8.10	8.10	8.10	7.70
FIELD pH		6.70	6.70	7.00	6.20	7.10

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL MCW2

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3640

DATE	LEVEL	READING	CHANGE
3 1 1976	3578.76	61.24	00.00
3 31 1976	3578.51	61.49	00.25
4 26 1976	3578.37	61.63	00.14
5 26 1976	3574.54	65.46	03.83
6 24 1976	3546.29	93.71	28.25
7 29 1976	3574.54	65.46	-28.25
9 7 1976	3574.45	65.55	00.09
9 21 1976	3573.67	66.33	00.78
10 26 1976	3573.64	66.36	00.03
11 15 1976	3573.26	66.74	00.38
12 15 1976	3575.90	64.10	-02.64
1 24 1977	3577.48	62.52	-01.58
3 15 1977	3573.55	66.45	03.93
4 21 1977	3575.05	64.95	-01.50
5 23 1977	3572.78	67.22	02.27
6 14 1977	3576.30	63.70	-03.52
7 20 1977	3576.26	63.74	00.04
8 31 1977	3576.03	63.97	00.23
1 11 1978	3577.18	62.82	-01.15
4 12 1978	3575.70	64.30	01.48
7 7 1978	3590.20	49.80	-14.50
9 6 1978	3584.05	55.95	06.15
10 23 1978	3581.81	58.19	02.24
12 8 1978	3583.14	56.86	-01.33
1 15 1979	3583.68	56.32	-00.54
3 1 1979	3583.27	56.73	00.41
5 13 1979	3581.41	58.59	01.86
6 13 1979	3581.47	58.53	-00.06
7 27 1979	3579.83	60.17	01.64
8 15 1979	3580.20	59.80	-00.37

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
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WELL MCW 1 (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		092977	MEAN	ST.DEV	#
POTASSIUM	PPM	10.00	8.33	1.25	6.00
SODIUM	PPM	190	152	24.00	6.00
CALCIUM	PPM	85.00	136	67.11	6.00
MAGNESIUM	PPM	104	74.50	38.27	6.00
SULFATE	PPM	500	426	55.99	6.00
CHLORIDE	PPM	9.00	9.50	2.81	6.00
CARBONATE	PPM	0.00	2.00	4.47	6.00
BICARBONATE	PPM	671	652	16.59	6.00
FLOURIDE	PPM	0.37	0.48	0.08	6.00
SILICON DIO	PPM	13.00	13.33	0.94	6.00
TOTAL P	PPM	0.43	0.09	0.17	6.00
NITRATE	PPM	0.10	0.57	1.69	6.00
POTASSIUM	EPM	0.26	0.21		
SODIUM	EPM	8.26	6.60		
CALCIUM	EPM	4.24	6.80		
MAGNESIUM	EPM	8.56	6.13		
SULFATE	EPM	10.41	8.87		
CHLORIDE	EPM	0.25	0.27		
CARBONATE	EPM	0.00	0.07		
BICARBONATE	EPM	11.00	10.69		
FLOURIDE	EPM	0.02	0.03		
NITRATE	EPM	0.01	0.00		
TOTAL CATIONS		21.32	19.75	0.94	6.00
TOTAL ANIONS		21.62	19.85	1.23	6.00
DEVIATION		101	100	2.66	6.00
TDS (calc.)		1228	1129	71.12	6.00
TDS @180		1208	1134	39.10	6.00
TOTAL HARDNESS		639	646	10.83	6.00
ALKALINITY		550	538	8.66	6.00
NON-CARB HARD		89.00	108	12.25	6.00
LAB CONDUCTIVITY		1712	1678	129	6.00
FIELD COND.		1190	1190	0.00	1.00
LAB pH		8.20	7.93	0.29	6.00
FIELD pH		7.36	6.84	0.37	6.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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PAGE NUMBER
EPA-287 (Cin.)
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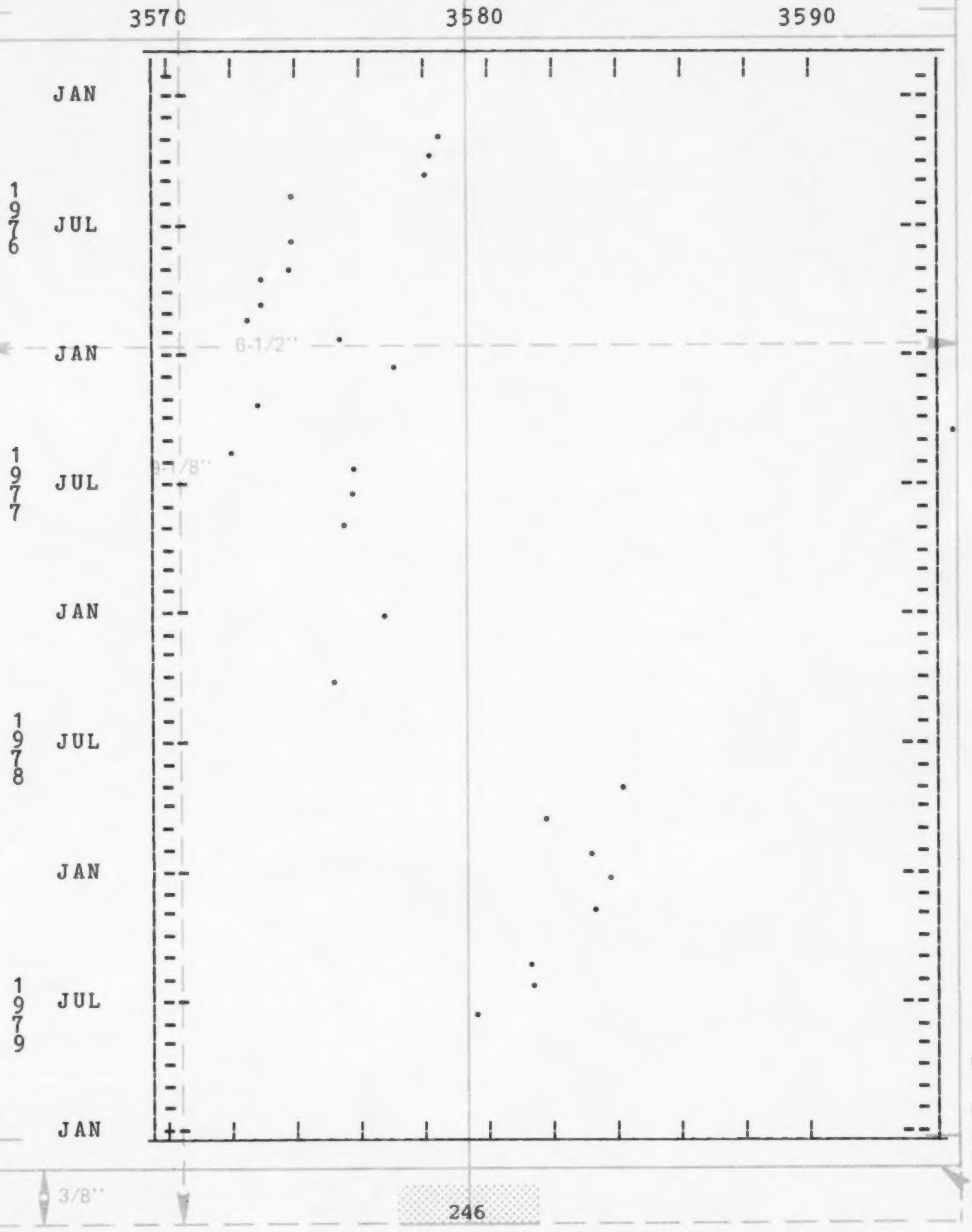
HYDROGRAPH FOR WELL MCW2

WATER LEVEL (FEET ABOVE MSL)



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9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL MCW #2 (WALL COAL SEAM AQUIFER) 1 of 3

DATE		011476	033176	062476	092176	121576
POTASSIUM	PPM	12.00	20.00	21.00	15.00	10.00
SODIUM	PPM	236	275	245	236	420
CALCIUM	PPM	118	126	113	276	272
MAGNESIUM	PPM	125	114	130	23.00	28.00
SULFATE	PPM	954	986	931	923	1313
CHLORIDE	PPM	7.00	9.00	11.00	11.00	13.00
CARBONATE	PPM	0.00	0.00	12.00	0.00	0.00
BICARBONATE	PPM	464	464	476	464	464
FLOURIDE	PPM	1.40	1.10	1.10	1.20	1.60
SILICON DIO	PPM	11.00	8.00	12.00	13.00	11.00
TOTAL P	PPM	0.12	0.10	0.05	0.01	0.03
NITRATE	PPM	5.10	4.00	3.00	1.00	4.00
POTASSIUM	EPM	0.31	0.51	0.54	0.38	0.26
SODIUM	EPM	10.27	11.96	10.66	10.27	18.27
CALCIUM	EPM	5.89	6.29	5.64	13.77	13.57
MAGNESIUM	EPM	10.28	9.38	10.69	1.89	2.30
SULFATE	EPM	19.86	20.53	19.38	19.22	27.34
CHLORIDE	EPM	0.20	0.25	0.31	0.31	0.37
CARBONATE	EPM	0.00	0.00	0.40	0.00	0.00
BICARBONATE	EPM	7.60	7.60	7.80	7.60	7.60
FLOURIDE	EPM	0.07	0.06	0.06	0.06	0.08
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		26.74	28.14	27.53	26.31	34.40
TOTAL ANIONS		27.69	28.38	27.87	27.11	35.30
DEVIATION		104	101	101	103	103
TDS (calc.)		1680	1758	1697	1712	2284
TDS @180		1797	1831	1709	1763	2309
TOTAL HARDNESS		808	784	816	782	792
ALKALINITY		380	380	410	380	380
NON-CARB HARD		428	404	406	402	412
LAB CONDUCTIVITY		2000	2200	2500	2500	3200
FIELD COND.						
LAB pH		7.80	7.80	8.30	8.30	7.90
FIELD pH		7.10	6.30	6.90	6.70	7.20

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL MCW #2 (WALL COAL SEAM AQUIFER) 2 of 3

DATE		031577	061477	092977
POTASSIUM	PPM	15.00	16.00	17.00
SODIUM	PPM	270	255	230
CALCIUM	PPM	137	136	155
MAGNESIUM	PPM	108	108	112
SULFATE	PPM	963	953	895
CHLORIDE	PPM	10.00	12.00	13.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	451	451	537
FLOURIDE	PPM	1.50	0.72	1.00
SILICON DIO	PPM	13.00	14.00	14.00
TOTAL P	PPM	0.02	0.10	0.16
NITRATE	PPM	4.20	3.30	2.30
POTASSIUM	EPM	0.38	0.41	0.43
SODIUM	EPM	11.74	11.09	10.00
CALCIUM	EPM	6.84	6.79	7.73
MAGNESIUM	EPM	8.88	8.88	9.21
SULFATE	EPM	20.05	19.84	18.63
CHLORIDE	EPM	0.28	0.34	0.37
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	7.39	7.39	8.80
FLOURIDE	EPM	0.08	0.04	0.05
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		27.85	27.17	27.39
TOTAL ANIONS		27.73	27.52	27.76
DEVIATION		99.57	101	101
TDS (calc.)		1725	1702	1686
TDS @180		1716	1744	1705
TOTAL HARDNESS		783	781	847
ALKALINITY		370	370	440
NON-CARB HARD		413	411	407
LAB CONDUCTIVITY		2400	2304	2178
FIELD COND.				1740
LAB pH		7.30	7.60	7.80
FIELD pH		7.30		7.49

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL MCW #2 (WALL COAL SEAM AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	15.75	3.46	8.00
SODIUM	PPM	271	58.40	8.00
CALCIUM	PPM	167	63.15	8.00
MAGNESIUM	PPM	93.50	39.95	8.00
SULFATE	PPM	990	125	8.00
CHLORIDE	PPM	10.75	1.92	8.00
CARBONATE	PPM	1.50	3.97	8.00
BICARBONATE	PPM	471	25.92	8.00
FLOURIDE	PPM	1.20	0.27	8.00
SILICON DIO	PPM	12.00	1.87	8.00
TOTAL P	PPM	0.05	0.08	8.00
NITRATE	PPM	3.36	1.19	8.00
POTASSIUM	EPM	0.40		
SODIUM	EPM	11.78		
CALCIUM	EPM	8.31		
MAGNESIUM	EPM	7.69		
SULFATE	EPM	20.61		
CHLORIDE	EPM	0.30		
CARBONATE	EPM	0.05		
BICARBONATE	EPM	7.73		
FLOURIDE	EPM	0.06		
NITRATE	EPM	0.00		
TOTAL CATIONS		28.19	2.41	8.00
TOTAL ANIONS		28.67	2.53	8.00
DEVIATION		102	1.21	8.00
TDS (calc.)		1780	192	8.00
TDS @180		1822	189	8.00
TOTAL HARDNESS		799	21.84	8.00
ALKALINITY		389	22.60	8.00
NON-CARB HARD		410	7.60	8.00
LAB CONDUCTIVITY		2410	339	8.00
FIELD COND.		1740	0.00	1.00
LAB pH		7.85	0.31	8.00
FIELD pH		7.00	0.37	7.00

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL MCW3

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3460

DATE	LEVEL	READING	CHANGE
1 13 1975	3445.91	14.09	00.00
3 1 1976	3445.97	14.03	-00.06
3 31 1976	3445.53	14.47	00.44
4 26 1976	3445.89	14.11	-00.36
5 26 1976	3446.14	13.86	-00.25
6 24 1976	3446.11	13.89	00.03
7 29 1976	3444.73	15.27	01.38
9 7 1976	3445.15	14.85	-00.42
9 21 1976	3445.18	14.82	-00.03
10 26 1976	3315.54	144.46	129.64
11 16 1976	3445.61	14.39	-130.07
12 15 1976	3445.66	14.34	-00.05
1 24 1977	3445.00	15.00	00.66
3 15 1977	3446.02	13.98	-01.02
4 21 1977	3443.96	16.04	02.06
5 23 1977	3446.41	13.59	-02.45
6 14 1977	3446.04	13.96	00.37
7 22 1977	3445.41	14.59	00.63
8 31 1977	3445.46	14.54	-00.05
9 29 1977	3445.76	14.24	-00.30
1 11 1978	3447.78	12.22	-02.02
1 24 1978	3446.09	13.91	01.69
4 12 1978	3446.66	13.34	-00.57
7 7 1978	3447.50	12.50	-00.84
9 6 1978	3446.45	13.55	01.05
10 23 1978	3446.82	13.18	-00.37
12 8 1978	3446.77	13.23	00.05
1 15 1979	3445.77	14.23	01.00
3 1 1979	3446.66	13.34	-00.89
3 21 1979	3447.20	12.80	-00.54
5 10 1979	3447.30	12.70	-00.10
6 13 1979	3445.81	14.19	01.49
7 27 1979	3446.29	13.71	-00.48
8 15 1979	3446.14	13.86	00.15

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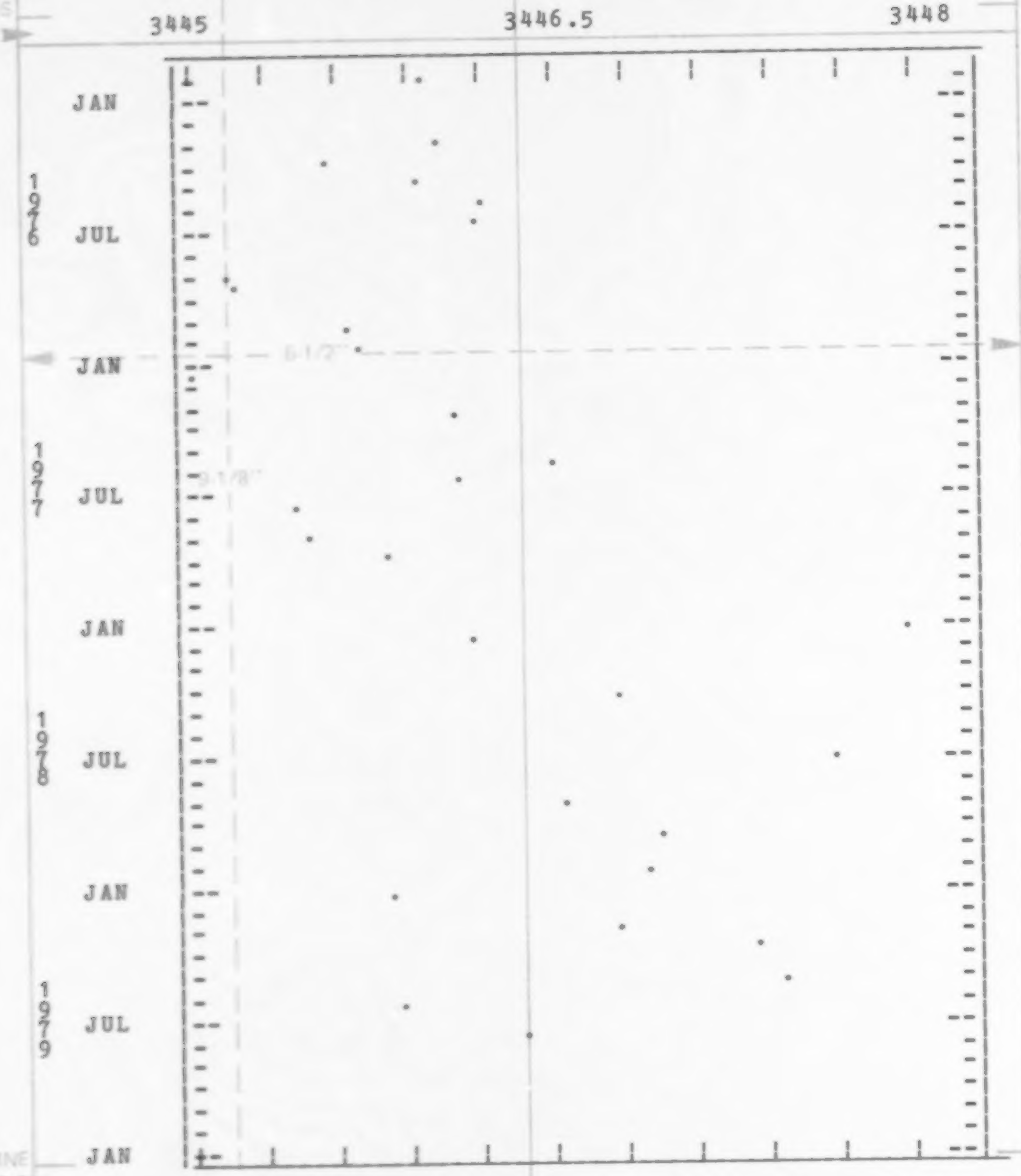
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL MCW3

WATER LEVEL (FEET ABOVE MSL)



6-1/2"

3-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

WELL MCW 3 (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		121576	031577	061477	092977
POTASSIUM	PPM	12.00	13.00	14.00	15.00
SODIUM	PPM	100.00	110	110	120
CALCIUM	PPM	274	166	158	89.00
MAGNESIUM	PPM	17.00	76.00	73.00	133
SULFATE	PPM	559	474	491	484
CHLORIDE	PPM	14.00	8.00	11.00	13.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	500	598	561	610
FLOURIDE	PPM	0.90	1.00	0.90	0.71
SILICON DIO	PPM	24.00	28.00	32.00	29.00
TOTAL P	PPM	0.03	0.14	0.22	0.09
NITRATE	PPM	3.00	0.10	0.10	0.10
POTASSIUM	EPM	0.31	0.33	0.36	0.38
SODIUM	EPM	4.35	4.78	4.78	5.22
CALCIUM	EPM	13.67	8.28	7.88	4.44
MAGNESIUM	EPM	1.40	6.25	6.00	10.94
SULFATE	EPM	11.64	9.87	10.22	10.08
CHLORIDE	EPM	0.39	0.23	0.31	0.37
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.19	9.80	9.19	10.00
FLOURIDE	EPM	0.05	0.05	0.05	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		19.73	19.65	19.03	20.99
TOTAL ANIONS		20.17	19.89	19.70	20.38
DEVIATION		102	101	103	97.14
TDS (calc.)		1222	1141	1133	1154
TDS @180		1180	1153	1144	1166
TOTAL HARDNESS		752	726	694	769
ALKALINITY		410	490	460	500
NON-CARB HARD		342	236	234	269
LAB CONDUCTIVITY		1500	1650	1642	1579
FIELD COND.					1120
LAB pH		7.80	7.80	7.60	7.60
FIELD pH		6.70	7.40		7.44

WELL MCW 3 (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	13.50	1.12	4.00
SODIUM	PPM	110	7.07	4.00
CALCIUM	PPM	172	66.19	4.00
MAGNESIUM	PPM	74.75	41.03	4.00
SULFATE	PPM	502	33.46	4.00
CHLORIDE	PPM	11.50	2.29	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	567	42.82	4.00
FLOURIDE	PPM	0.88	0.10	4.00
SILICON DIO	PPM	28.25	2.86	4.00
TOTAL P	PPM	0.12	0.07	4.00
NITRATE	PPM	0.72	1.32	4.00
POTASSIUM	EPM	0.35		
SODIUM	EPM	4.78		
CALCIUM	EPM	8.57		
MAGNESIUM	EPM	6.15		
SULFATE	EPM	10.45		
CHLORIDE	EPM	0.32		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	9.30		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		19.85	0.71	4.00
TOTAL ANIONS		20.04	0.26	4.00
DEVIATION		101	2.39	4.00
TDS (calc.)		1162	35.17	4.00
TDS @180		1161	13.56	4.00
TOTAL HARDNESS		735	28.32	4.00
ALKALINITY		465	35.00	4.00
NON-CARB HARD		270	43.69	4.00
LAB CONDUCTIVITY		1593	60.19	4.00
FIELD COND.		1120	0.00	1.00
LAB pH		7.70	0.10	4.00
FIELD pH		7.18	0.34	3.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL MCW4

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3374

DATE	LEVEL	READING	CHANGE
1 13 1976	3327.75	46.25	00.00
5 26 1976	3327.76	46.24	-00.01
6 24 1976	3327.74	46.26	00.02
7 29 1976	3327.55	46.45	00.19
9 7 1976	3327.05	46.95	00.50
9 22 1976	3326.96	47.04	00.09
10 26 1976	3327.05	46.95	-00.09
11 16 1976	3327.09	46.91	-00.04
12 15 1976	3326.92	47.08	00.17
1 24 1977	3326.13	47.87	00.79
2 18 1977	3326.17	47.83	-00.04
3 15 1977	3327.02	46.98	-00.85
4 21 1977	3327.57	46.43	-00.55
5 23 1977	3327.94	46.06	-00.37
6 14 1977	3327.74	46.26	00.20
7 20 1977	3327.42	46.58	00.32
8 31 1977	3327.43	46.57	-00.01
9 29 1977	3327.80	46.20	-00.37
1 11 1978	3328.25	45.75	-00.45
1 24 1978	3327.30	46.70	00.95
4 12 1978	3328.38	45.62	-01.08
7 7 1978	3329.51	44.49	-01.13
9 6 1978	3327.88	46.12	01.63
10 23 1978	3329.82	44.18	-01.94
12 8 1978	3326.60	47.40	03.22
1 19 1979	3328.69	45.31	-02.09
3 1 1979	3329.23	44.77	-00.54
3 21 1979	3327.50	46.50	01.73
5 10 1979	3327.01	46.99	00.49
6 13 1979	3329.10	44.90	-02.09
7 27 1979	3327.42	46.58	01.68
8 15 1979	3327.42	46.58	00.00

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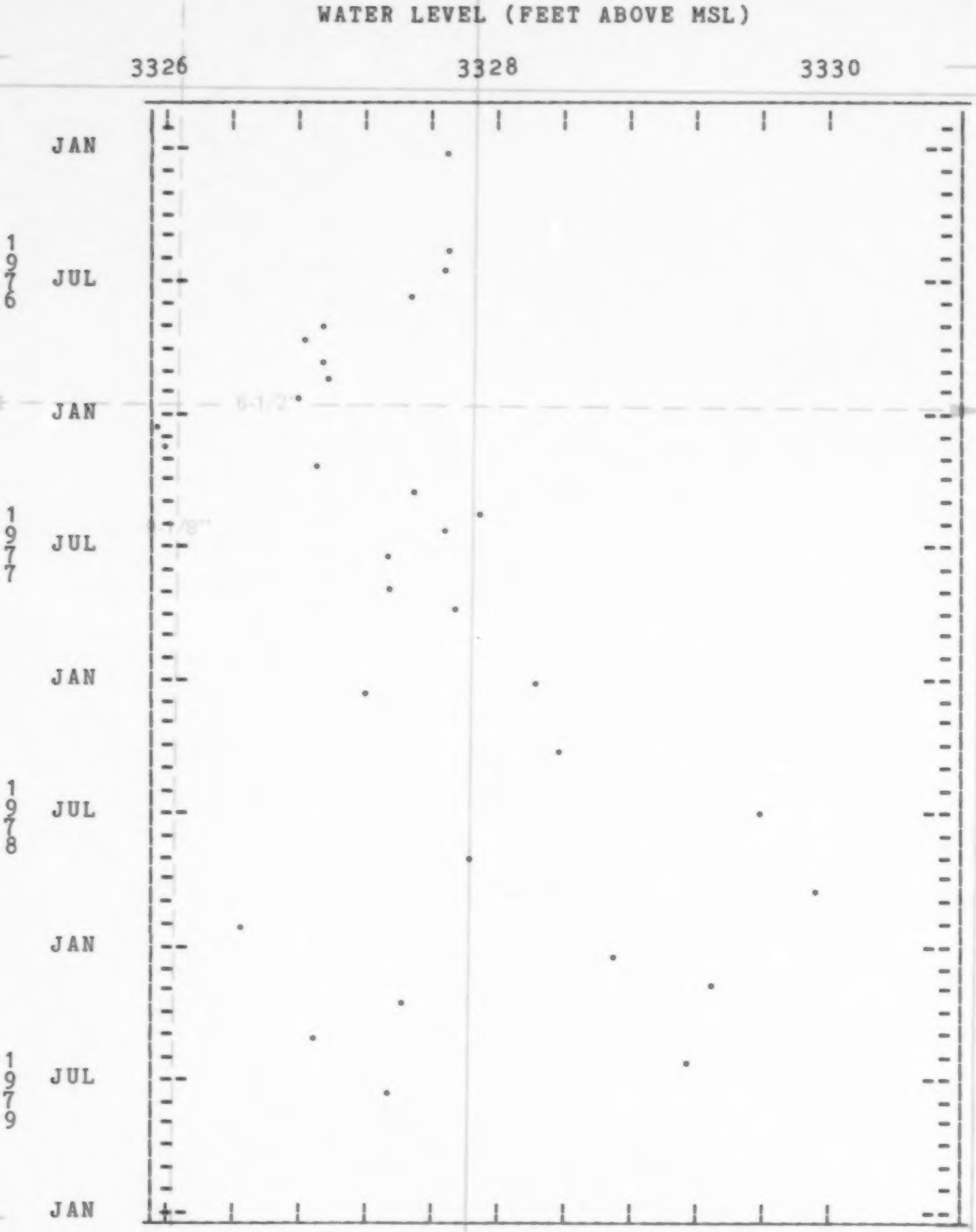
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL MCW4



EPA-287 (Cin.)
(4-76)

WELL MCW 4 1 of 3

DATE		011476	033176	062476	092276	121576
POTASSIUM	PPM	10.00	15.00	15.00	15.00	13.00
SODIUM	PPM	107	160	135	144	143
CALCIUM	PPM	98.00	112	101	306	296
MAGNESIUM	PPM	169	156	158	38.00	31.00
SULFATE	PPM	662	734	704	702	699
CHLORIDE	PPM	6.00	9.00	9.00	14.00	13.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	24.00
BICARBONATE	PPM	616	647	622	634	586
FLOURIDE	PPM	1.10	1.10	0.90	1.00	1.10
SILICON DIO	PPM	10.00	8.00	12.00	13.00	9.00
TOTAL P	PPM	0.11	0.10	0.17	0.01	0.06
NITRATE	PPM	1.80	1.00	1.00	1.00	3.00
POTASSIUM	EPM	0.26	0.38	0.38	0.38	0.33
SODIUM	EPM	4.65	6.96	5.87	6.26	6.22
CALCIUM	EPM	4.89	5.59	5.04	15.27	14.77
MAGNESIUM	EPM	13.90	12.83	13.00	3.13	2.55
SULFATE	EPM	13.78	15.28	14.66	14.62	14.55
CHLORIDE	EPM	0.17	0.25	0.25	0.39	0.37
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.80
BICARBONATE	EPM	10.10	10.60	10.19	10.39	9.60
FLOURIDE	EPM	0.06	0.06	0.05	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		23.70	25.76	24.29	25.04	23.87
TOTAL ANIONS		24.06	26.13	25.09	25.35	25.29
DEVIATION		102	101	103	101	106
TDS (calc.)		1355	1504	1428	1531	1507
TDS @180		1570	1504	1512	1446	1454
TOTAL HARDNESS		941	922	902	921	866
ALKALINITY		505	530	510	520	480
NON-CARB HARD		436	392	392	401	386
LAB CONDUCTIVITY		2000	2000	1900	2000	2100
FIELD COND.						
LAB pH		7.30	7.80	8.10	8.10	7.70
FIELD pH		7.00	6.50	6.90	6.40	6.60

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL MCW 4 2 of 3

DATE		121576	031577	061477	092977
POTASSIUM	PPM	13.00	15.00	17.00	18.00
SODIUM	PPM	143	130	165	170
CALCIUM	PPM	296	105	59.00	93.00
MAGNESIUM	PPM	31.00	154	142	159
SULFATE	PPM	699	697	485	695
CHLORIDE	PPM	13.00	9.00	10.00	11.00
CARBONATE	PPM	24.00	0.00	0.00	0.00
BICARBONATE	PPM	586	610	708	610
FLOURIDE	PPM	1.10	1.20	1.10	0.90
SILICON DIO	PPM	9.00	13.00	12.00	12.00
TOTAL P	PPM	0.06	0.02	0.08	0.16
NITRATE	PPM	3.00	0.20	0.10	0.10
POTASSIUM	EPM	0.33	0.38	0.43	0.46
SODIUM	EPM	6.22	5.65	7.18	7.39
CALCIUM	EPM	14.77	5.24	2.94	4.64
MAGNESIUM	EPM	2.55	12.67	11.68	13.08
SULFATE	EPM	14.55	14.51	10.10	14.47
CHLORIDE	EPM	0.37	0.25	0.28	0.31
CARBONATE	EPM	0.80	0.00	0.00	0.00
BICARBONATE	EPM	9.60	10.00	11.60	10.00
FLOURIDE	EPM	0.06	0.06	0.06	0.05
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		23.87	23.95	22.24	25.58
TOTAL ANIONS		25.29	24.76	21.97	24.75
DEVIATION		106	103	98.79	96.76
TDS (calc.)		1507	1410	1226	1446
TDS @180		1454	1513	1357	2421
TOTAL HARDNESS		866	897	730	884
ALKALINITY		480	500	580	500
NON-CARB HARD		386	397	150	384
LAB CONDUCTIVITY		2100	2000	2016	1912
FIELD COND.					1360
LAB pH		7.70	7.70	8.00	7.70
FIELD pH		6.60	7.10		7.60

TYPING GUIDE SHEET

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TOP OF IMAGE AREA

DROPPED HEAD; BEGIN SECTIONS HERE

WELL MCW 4 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	14.56	2.22	9.00
SODIUM	PPM	144	18.32	9.00
CALCIUM	PPM	163	97.51	9.00
MAGNESIUM	PPM	115	58.38	9.00
SULFATE	PPM	675	69.41	9.00
CHLORIDE	PPM	10.44	2.41	9.00
CARBONATE	PPM	5.33	9.98	9.00
BICARBONATE	PPM	624	35.01	9.00
FLOURIDE	PPM	1.06	0.10	9.00
SILICON DIO	PPM	10.89	1.79	9.00
TOTAL P	PPM	0.06	0.08	9.00
NITRATE	PPM	0.53	1.55	9.00
POTASSIUM	EPM	0.37		
SODIUM	EPM	6.27		
CALCIUM	EPM	8.13		
MAGNESIUM	EPM	9.49		
SULFATE	EPM	14.06		
CHLORIDE	EPM	0.29		
CARBONATE	EPM	0.18		
BICARBONATE	EPM	10.23		
FLOURIDE	EPM	0.06		
NITRATE	EPM	0.00		
TOTAL CATIONS		24.26	1.02	9.00
TOTAL ANIONS		24.74	1.11	9.00
DEVIATION		102	2.85	9.00
TDS (calc.)		1435	91.42	9.00
TDS @180		1581	302	9.00
TOTAL HARDNESS		881	58.54	9.00
ALKALINITY		512	28.67	9.00
NON-CARB HARD		369	78.96	9.00
LAB CONDUCTIVITY		2003	64.92	9.00
FIELD COND.		1360	0.00	1.00
LAB pH		7.79	0.24	9.00
FIELD pH		6.84	0.37	8.00

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

1 of 1

WELL MCW5

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3280

DATE	LEVEL	READING	CHANGE
1 13 1976	3263.11	16.89	00.00
3 1 1976	3263.17	16.83	-00.06
3 31 1976	3264.04	15.96	-00.87
4 26 1976	3263.73	16.27	00.31
5 26 1976	3263.23	16.77	00.50
6 24 1976	3263.84	16.16	-00.61
7 29 1976	3263.29	16.71	00.55
9 7 1976	3262.92	17.08	00.37
9 22 1976	3263.20	16.80	-00.28
10 26 1976	3263.33	16.67	-00.13
11 16 1976	3263.42	16.58	-00.09
12 15 1976	3263.33	16.67	00.09
1 24 1977	3263.23	16.77	00.10
2 18 1977	3263.23	16.77	00.00
3 15 1977	3263.49	16.51	-00.26
4 21 1977	3264.00	16.00	-00.51
6 23 1977	3264.08	15.92	-00.08
6 14 1977	3263.05	16.95	01.03
7 22 1977	3263.66	16.34	-00.61
8 31 1977	3263.76	16.24	-00.10
9 29 1977	3263.84	16.16	-00.08
1 24 1978	3263.41	16.59	00.43
3 1 1978	3263.13	16.87	00.28
4 12 1978	3263.71	16.29	-00.58
7 7 1978	3264.32	15.68	-00.61
9 6 1978	3263.26	16.74	01.06
10 23 1978	3263.70	16.30	-00.44
5 10 1979	3263.71	16.29	-00.01
6 13 1979	3264.30	15.70	-00.59

6-1/2"
9-1/8"
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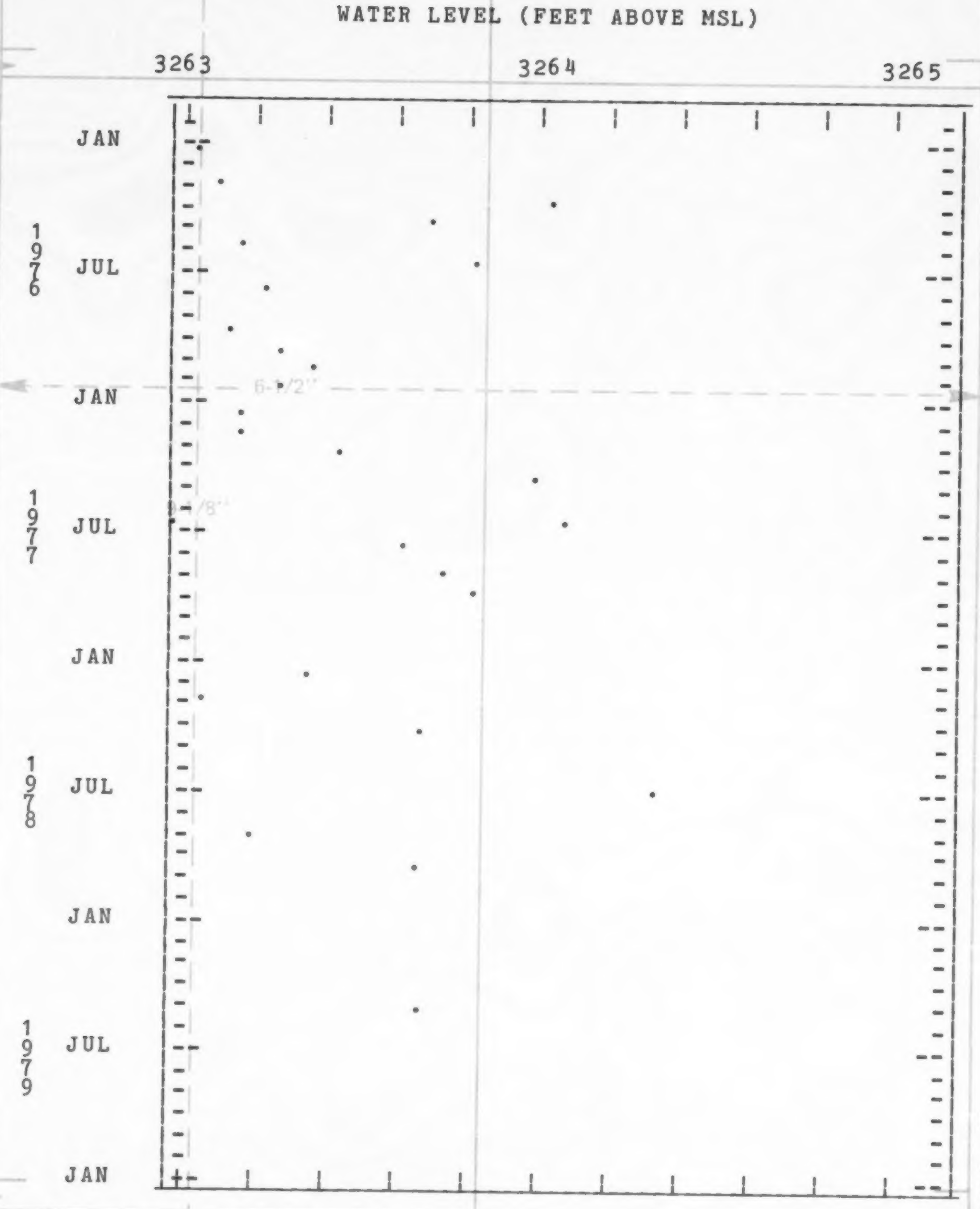
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL MCW5



6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL MCW 5 (UNCONSOLIDATED AQUIFER) 1 of 3

DATE		011476	033176	062476	092276	121576
POTASSIUM	PPM	9.00	15.00	15.00	15.00	13.00
SODIUM	PPM	164	167	135	165	131
CALCIUM	PPM	94.00	100.00	83.00	326	322
MAGNESIUM	PPM	169	166	166	31.00	40.00
SULFATE	PPM	706	179	711	721	721
CHLORIDE	PPM	6.00	5.00	9.00	13.00	13.00
CARBONATE	PPM	0.00	0.00	18.00	0.00	0.00
BICARBONATE	PPM	653	695	561	659	659
FLOURIDE	PPM	1.10	0.90	0.90	1.10	1.10
SILICON DIO	PPM	22.00	7.00	13.00	29.00	17.00
TOTAL P	PPM	0.08	0.10	0.12	0.02	0.14
NITRATE	PPM	0.50	1.00	1.00	3.00	2.00
POTASSIUM	EPM	0.23	0.38	0.38	0.38	0.33
SODIUM	EPM	7.13	7.26	5.87	7.18	5.70
CALCIUM	EPM	4.69	4.99	4.14	16.27	16.07
MAGNESIUM	EPM	13.90	13.66	13.66	2.55	3.29
SULFATE	EPM	14.70	3.73	14.80	15.01	15.01
CHLORIDE	EPM	0.17	0.14	0.25	0.37	0.37
CARBONATE	EPM	0.00	0.00	0.60	0.00	0.00
BICARBONATE	EPM	10.70	11.39	9.19	10.80	10.80
FLOURIDE	EPM	0.06	0.05	0.05	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		25.96	26.29	24.05	26.38	25.39
TOTAL ANIONS		25.59	15.27	24.83	26.14	26.14
DEVIATION		98.57	58.07	103	99.10	103
TDS (calc.)		1469	1513	1413	1595	1564
TDS @180		1669	1529	1537	1536	1549
TOTAL HARDNESS		931	931	889	941	966
ALKALINITY		535	570	490	540	540
NON-CARB HARD		396	361	399	401	426
LAB CONDUCTIVITY		2000	2000	2000	1800	1900
FIELD COND.						
LAB pH		7.60	7.90	8.20	7.90	7.80
FIELD pH		7.20	6.80	6.90	6.60	6.80

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL MCW 5 (UNCONSOLIDATED AQUIFER) 2 of 3

DATE		031577	061477	092977
POTASSIUM	PPM	20.00	19.00	20.00
SODIUM	PPM	140	150	180
CALCIUM	PPM	117	238	23.00
MAGNESIUM	PPM	161	87.00	233
SULFATE	PPM	731	723	789
CHLORIDE	PPM	8.00	11.00	13.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	671	659	695
FLOURIDE	PPM	1.30	1.10	0.96
SILICON DIO	PPM	28.00	29.00	25.00
TOTAL P	PPM	0.03	0.20	0.28
NITRATE	PPM	0.10	0.10	0.10
POTASSIUM	EPM	0.51	0.49	0.51
SODIUM	EPM	6.09	6.52	7.83
CALCIUM	EPM	5.84	11.88	1.15
MAGNESIUM	EPM	13.24	7.16	19.17
SULFATE	EPM	15.22	15.05	16.43
CHLORIDE	EPM	0.23	0.31	0.37
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	11.00	10.80	11.39
FLOURIDE	EPM	0.07	0.06	0.05
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		25.68	26.04	28.66
TOTAL ANIONS		26.45	26.14	28.14
DEVIATION		103	100	98.21
TDS (calc.)		1507	1552	1600
TDS @180		1574	1535	1645
TOTAL HARDNESS		955	954	1016
ALKALINITY		550	540	570
NON-CARB HARD		405	414	446
LAB CONDUCTIVITY		2100	2064	2083
FIELD COND.				1500
LAB pH		7.70	7.70	7.90
FIELD pH		7.40		7.30

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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-78)

WELL MCW 5 (UNCONSOLIDATED AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	15.75	3.56	8.00
SODIUM	PPM	154	16.46	8.00
CALCIUM	PPM	163	109	8.00
MAGNESIUM	PPM	132	66.53	8.00
SULFATE	PPM	660	183	8.00
CHLORIDE	PPM	9.75	3.03	8.00
CARBONATE	PPM	2.25	5.95	8.00
BICARBONATE	PPM	656	39.25	8.00
FLOURIDE	PPM	1.06	0.13	8.00
SILICON DIO	PPM	21.25	7.66	8.00
TOTAL P	PPM	0.10	0.11	8.00
NITRATE	PPM	0.42	1.32	8.00
POTASSIUM	EPM	0.40		
SODIUM	EPM	6.70		
CALCIUM	EPM	8.13		
MAGNESIUM	EPM	10.83		
SULFATE	EPM	13.74		
CHLORIDE	EPM	0.28		
CARBONATE	EPM	0.07		
BICARBONATE	EPM	10.76		
FLOURIDE	EPM	0.06		
NITRATE	EPM	0.00		
TOTAL CATIONS		26.06	1.20	8.00
TOTAL ANIONS		24.84	3.72	8.00
DEVIATION		95.44	14.26	8.00
TDS (calc.)		1527	60.10	8.00
TDS @180		1572	51.26	8.00
TOTAL HARDNESS		948	33.80	8.00
ALKALINITY		542	23.44	8.00
NON-CARB HARD		406	23.09	8.00
LAB CONDUCTIVITY		1993	93.97	8.00
FIELD COND.		1500	0.00	1.00
LAB pH		7.84	0.17	8.00
FIELD pH		7.00	0.28	7.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD, BEGIN SECTIONS HERE
8-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
3/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #5
Date Completed 5/27/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-2'	2'	Topsoil
2'-7'	5'	Clay, Gray
7'-14'	7'	Clay, Yellow Brown
14'-15'	1'	Sand, Gray
15'-70'	55'	Sand, Red, Burned
70'-80'	10'	Shale, Red, Burned
80'-83'	3'	Clinker, Red
83'-118'	35'	Sandy Shale, Gray

WELL NCRP5

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4195

DATE	LEVEL	READING	CHANGE
6 8 1976	4113.33	81.67	00.00
6 24 1976	4113.26	81.74	00.07
9 20 1976	4112.71	82.29	00.55
10 19 1976	4112.68	82.32	00.03
11 15 1976	4112.61	82.39	00.07
12 16 1976	4112.61	82.39	00.00
1 19 1977	4112.58	82.42	00.03
2 21 1977	4112.51	82.49	00.07
3 14 1977	4112.50	82.50	00.01
5 2 1977	4112.48	82.52	00.02
5 23 1977	4112.48	82.52	00.00
6 20 1977	4112.45	82.55	00.03
7 26 1977	4112.39	82.61	00.06
8 22 1977	4112.62	82.38	-00.23
10 27 1977	4112.32	82.68	00.30
12 20 1977	4112.30	82.70	00.02
1 19 1978	4112.27	82.73	00.03
3 1 1978	4112.21	82.79	00.06
4 5 1978	4112.41	82.59	-00.20
5 8 1978	4112.38	82.62	00.03
8 31 1978	4112.47	82.53	-00.09
10 19 1978	4112.41	82.59	00.06
12 6 1978	4112.46	82.54	-00.05
3 8 1979	4112.50	82.50	-00.04
3 27 1979	4112.51	82.49	-00.01
4 16 1979	4112.55	82.45	-00.04
6 45 1979	4112.57	82.43	-00.02
8 6 1979	4112.56	82.44	00.01
8 17 1979	4112.59	82.41	-00.03

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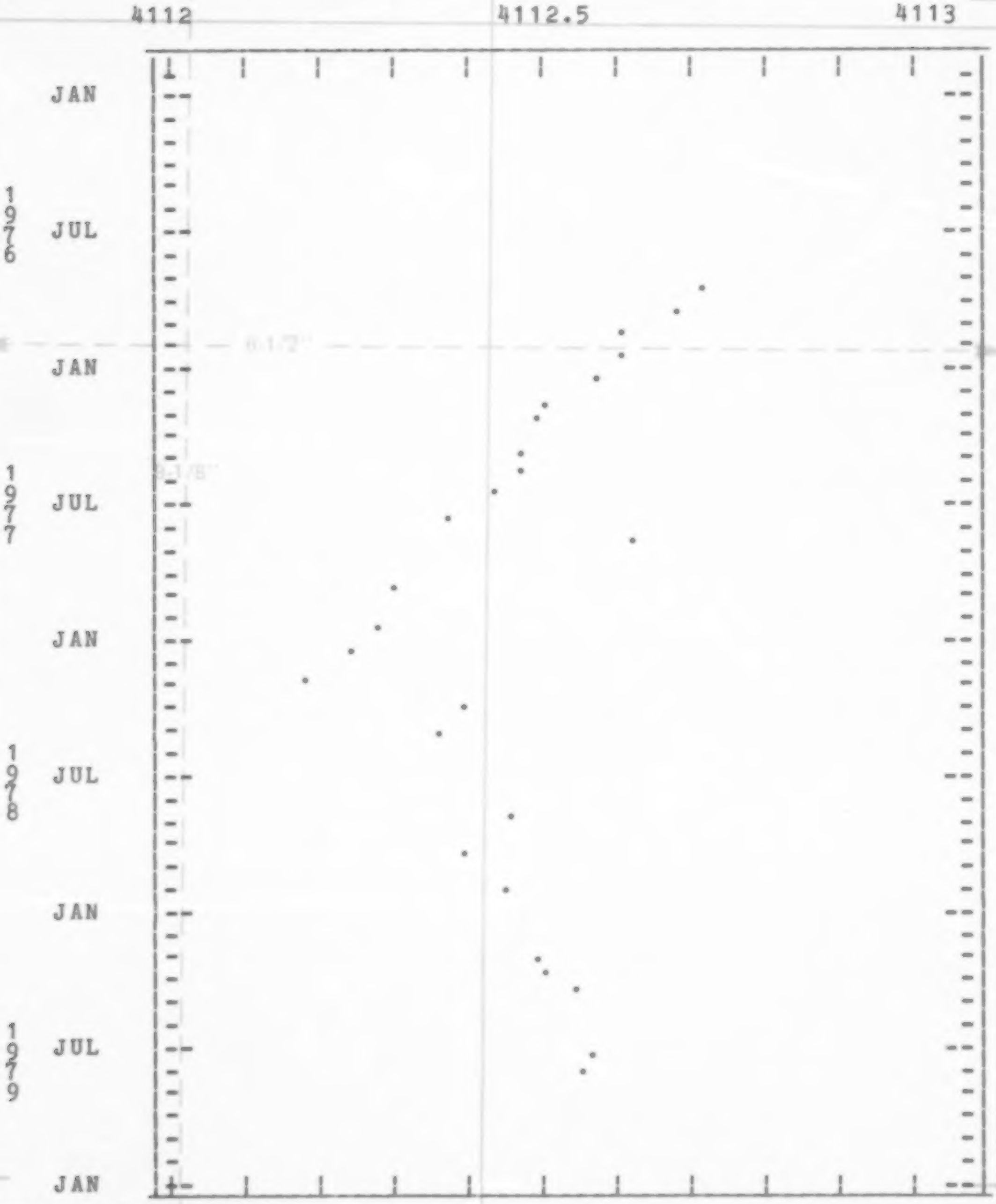
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP5

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 5 1 of 2

DATE		062476	122176	092177
POTASSIUM	PPM	7.00	5.00	5.00
SODIUM	PPM	15.00	11.00	11.00
CALCIUM	PPM	66.00	66.00	66.00
MAGNESIUM	PPM	19.00	20.00	20.00
SULFATE	PPM	20.00	16.00	2.00
CHLORIDE	PPM	4.00	3.00	4.00
CARBONATE	PPM	30.00	0.00	0.00
BICARBONATE	PPM	262	305	317
FLOURIDE	PPM	0.60	1.90	0.54
SILICON DIO	PPM	8.00	20.00	23.00
TOTAL P	PPM	0.07	0.01	0.14
NITRATE	PPM	3.00	1.00	1.10
POTASSIUM	EPM	0.18	0.13	0.13
SODIUM	EPM	0.65	0.48	0.48
CALCIUM	EPM	3.29	3.29	3.29
MAGNESIUM	EPM	1.56	1.65	1.65
SULFATE	EPM	0.42	0.33	0.04
CHLORIDE	EPM	0.11	0.08	0.11
CARBONATE	EPM	1.00	0.00	0.00
BICARBONATE	EPM	4.29	5.00	5.20
FLOURIDE	EPM	0.03	0.10	0.03
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		5.69	5.54	5.54
TOTAL ANIONS		5.83	5.49	5.35
DEVIATION		102	99.09	96.51
TDS (calc.)		290	271	264
TDS @180		318	291	280
TOTAL HARDNESS		242	248	246
ALKALINITY		265	250	260
NON-CARB HARD		0.00	0.00	0.00
LAB CONDUCTIVITY		550	520	495
FIELD COND.				335
LAB pH		8.30	7.60	7.50
FIELD pH		6.80	7.10	7.35

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 5 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	5.67	0.94	3.00
SODIUM	PPM	12.33	1.89	3.00
CALCIUM	PPM	66.00	0.00	3.00
MAGNESIUM	PPM	19.67	0.47	3.00
SULFATE	PPM	12.67	7.72	3.00
CHLORIDE	PPM	3.67	0.47	3.00
CARBONATE	PPM	10.00	14.14	3.00
BICARBONATE	PPM	295	23.61	3.00
FLOURIDE	PPM	1.01	0.63	3.00
SILICON DIO	PPM	17.00	6.48	3.00
TOTAL P	PPM	0.07	0.06	3.00
NITRATE	PPM	1.70	0.92	3.00
POTASSIUM	EPM	0.14		
SODIUM	EPM	0.54		
CALCIUM	EPM	3.29		
MAGNESIUM	EPM	1.62		
SULFATE	EPM	0.26		
CHLORIDE	EPM	0.10		
CARBONATE	EPM	0.33		
BICARBONATE	EPM	4.83		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		5.59	0.07	3.00
TOTAL ANIONS		5.56	0.20	3.00
DEVIATION		99.34	2.43	3.00
TDS (calc.)		275	10.99	3.00
TDS @180		296	15.96	3.00
TOTAL HARDNESS		245	2.50	3.00
ALKALINITY		258	6.24	3.00
NON-CARB HARD		0.00	0.00	3.00
LAB CONDUCTIVITY		522	22.48	3.00
FIELD COND.		335	0.00	1.00
LAB pH		7.80	0.36	3.00
FIELD pH		7.08	0.22	3.00

EPA-287 (Cin.)
(4-76)

WELL LDCW1

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3980

DATE	LEVEL	READING	CHANGE
11 25 1975	3956.66	23.34	00.00
1 21 1976	3956.92	23.08	-00.26
3 5 1976	3956.98	23.02	-00.06
3 25 1976	3956.47	23.53	00.51
5 2 1976	3956.93	23.07	-00.46
5 25 1976	3957.84	22.16	-00.91
6 21 1976	3957.49	22.51	00.35
7 29 1976	3957.07	22.93	00.42
9 7 1976	3956.51	23.49	00.56
9 20 1976	3956.56	23.44	-00.05
10 19 1976	3956.52	23.48	00.04
11 15 1976	3956.43	23.57	00.09
12 16 1976	3956.60	23.40	-00.17
2 21 1977	3956.86	23.14	-00.26
3 14 1977	3956.65	23.35	00.21
4 20 1977	3958.72	21.28	-02.07
5 23 1977	3957.50	22.50	01.22
6 13 1977	3957.14	22.86	00.36
7 20 1977	3956.44	23.56	00.70
8 31 1977	3956.33	23.67	00.11
9 27 1977	3956.27	23.73	00.06
10 27 1977	3956.30	23.70	-00.03
1 19 1978	3956.47	23.53	-00.17
3 1 1978	3956.52	23.48	-00.05
4 5 1978	3957.72	22.28	-01.20
7 7 1978	3958.44	21.56	-00.72
8 30 1978	3957.13	22.87	01.31
10 23 1978	3957.02	22.98	00.11
12 12 1978	3957.08	22.92	-00.06
3 1 1979	3957.14	22.86	-00.06
6 15 1979	3957.37	22.63	-00.23
8 6 1979	3956.38	23.62	00.99
8 17 1979	3956.33	23.67	00.05

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9-1/8"
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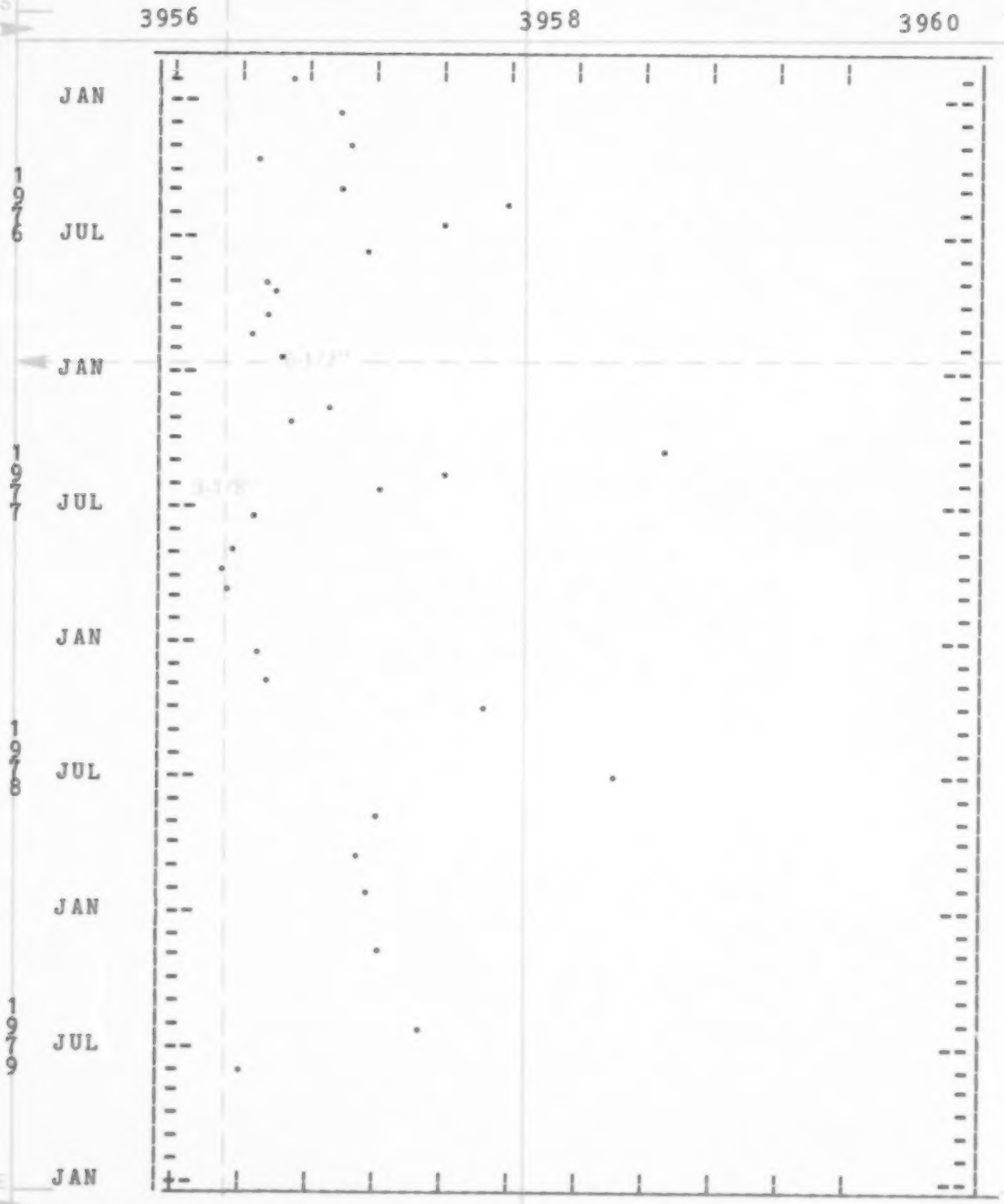
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL LDCW1



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 1

DATE		121775	032576	032576	062176	092076
POTASSIUM	PPM	5.00	6.00	6.00	5.00	5.00
SODIUM	PPM	18.00	20.00	20.00	23.00	28.00
CALCIUM	PPM	58.00	60.00	60.00	62.00	70.00
MAGNESIUM	PPM	28.00	30.00	30.00	28.00	22.00
SULFATE	PPM	15.00	17.00	17.00	26.00	12.00
CHLORIDE	PPM	6.00	3.00	3.00	3.00	8.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	336	384	384	354	378
FLOURIDE	PPM	1.00	0.90	0.90	0.70	0.70
SILICON DIO	PPM	18.00	11.00	11.00	20.00	23.00
TOTAL P	PPM	0.09	0.10	0.10	0.05	0.05
NITRATE	PPM	3.10	1.00	1.00	1.00	2.00
POTASSIUM	EPM	0.13	0.15	0.15	0.13	0.13
SODIUM	EPM	0.78	0.87	0.87	1.00	1.22
CALCIUM	EPM	2.89	2.99	2.99	3.09	3.49
MAGNESIUM	EPM	2.30	2.47	2.47	2.30	1.81
SULFATE	EPM	0.31	0.35	0.35	0.54	0.25
CHLORIDE	EPM	0.17	0.08	0.08	0.08	0.23
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	5.51	6.29	6.29	5.80	6.20
FLOURIDE	EPM	0.05	0.05	0.05	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		6.11	6.49	6.49	6.53	6.65
TOTAL ANIONS		6.00	6.76	6.76	6.44	6.65
DEVIATION		98.20	104	104	98.74	100
TDS (calc.)		313	324	324	321	331
TDS @180		272	344	344	329	337
TOTAL HARDNESS		261	273	273	269	263
ALKALINITY		275	315	315	290	310
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		513	600	600	650	450
FIELD COND.						
LAB pH		8.20	7.40	7.40	6.10	8.20
FIELD pH		7.20	6.80	6.80	6.30	6.50

1/2''
9-1/8''
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 1 2 of 3

DATE		092076	092076	121676	031477	061377
POTASSIUM	PPM	5.00	7.00	8.00	5.00	5.00
SODIUM	PPM	28.00	30.00	20.00	26.00	24.00
CALCIUM	PPM	70.00	74.00	78.00	60.00	63.00
MAGNESIUM	PPM	22.00	19.00	17.00	27.00	26.00
SULFATE	PPM	12.00	12.00	11.00	22.00	20.00
CHLORIDE	PPM	8.00	9.00	5.00	5.00	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	378	378	354	354	345
FLOURIDE	PPM	0.70	0.70	0.80	0.93	0.76
SILICON DIO	PPM	23.00	20.00	22.00	24.00	26.00
TOTAL P	PPM	0.05	0.04	0.06	0.07	0.07
NITRATE	PPM	2.00	1.00	1.00	1.50	1.10
POTASSIUM	EPM	0.13	0.18	0.20	0.13	0.13
SODIUM	EPM	1.22	1.31	0.87	1.13	1.04
CALCIUM	EPM	3.49	3.69	3.89	2.99	3.14
MAGNESIUM	EPM	1.81	1.56	1.40	2.22	2.14
SULFATE	EPM	0.25	0.25	0.23	0.46	0.42
CHLORIDE	EPM	0.23	0.25	0.14	0.14	0.17
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	6.20	6.20	5.80	5.80	5.65
FLOURIDE	EPM	0.04	0.04	0.04	0.05	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		6.65	6.74	6.37	6.47	6.45
TOTAL ANIONS		6.65	6.67	6.18	6.41	6.24
DEVIATION		100	98.97	97.06	99.08	96.63
TDS (calc.)		331	337	313	319	314
TDS @180		337	344	326	325	330
TOTAL HARDNESS		263	263	264	261	264
ALKALINITY		310	310	290	290	283
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		450	400	600	530	608
FIELD COND.						
LAB pH		8.20	8.00	7.90	7.30	7.70
FIELD pH		6.50	6.80			

EPA-287 (Cin.)
(4-76)

WELL LDCW 1 3 of 3

DATE		092777	MEAN	ST.DEV	#
POTASSIUM	PPM	5.00	5.64	0.98	11.00
SODIUM	PPM	24.00	23.73	3.77	11.00
CALCIUM	PPM	72.00	66.09	6.56	11.00
MAGNESIUM	PPM	21.00	24.55	4.31	11.00
SULFATE	PPM	14.00	16.18	4.59	11.00
CHLORIDE	PPM	7.00	5.73	2.05	11.00
CARBONATE	PPM	0.00	0.00	0.00	11.00
BICARBONATE	PPM	376	366	16.38	11.00
FLOURIDE	PPM	0.67	0.80	0.11	11.00
SILICON DIO	PPM	25.00	20.27	4.90	11.00
TOTAL P	PPM	0.07	0.03	0.06	11.00
NITRATE	PPM	1.40	0.92	1.31	11.00
POTASSIUM	EPM	0.13	0.14		
SODIUM	EPM	1.04	1.03		
CALCIUM	EPM	3.59	3.30		
MAGNESIUM	EPM	1.73	2.02		
SULFATE	EPM	0.29	0.34		
CHLORIDE	EPM	0.20	0.16		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	6.16	5.99		
FLOURIDE	EPM	0.04	0.04		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		6.49	6.49	0.16	11.00
TOTAL ANIONS		6.64	6.49	0.24	11.00
DEVIATION		102	99.93	2.46	11.00
TDS (calc.)		328	323	7.69	11.00
TDS @180		345	330	19.81	11.00
TOTAL HARDNESS		265	265	4.15	11.00
ALKALINITY		308	300	13.57	11.00
NON-CARB HARD		0.00	0.00	0.00	11.00
LAB CONDUCTIVITY		592	545	77.81	11.00
FIELD COND.		410	410	0.00	1.00
LAB pH		7.90	7.66	0.59	11.00
FIELD pH		7.20	6.76	0.30	8.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
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DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

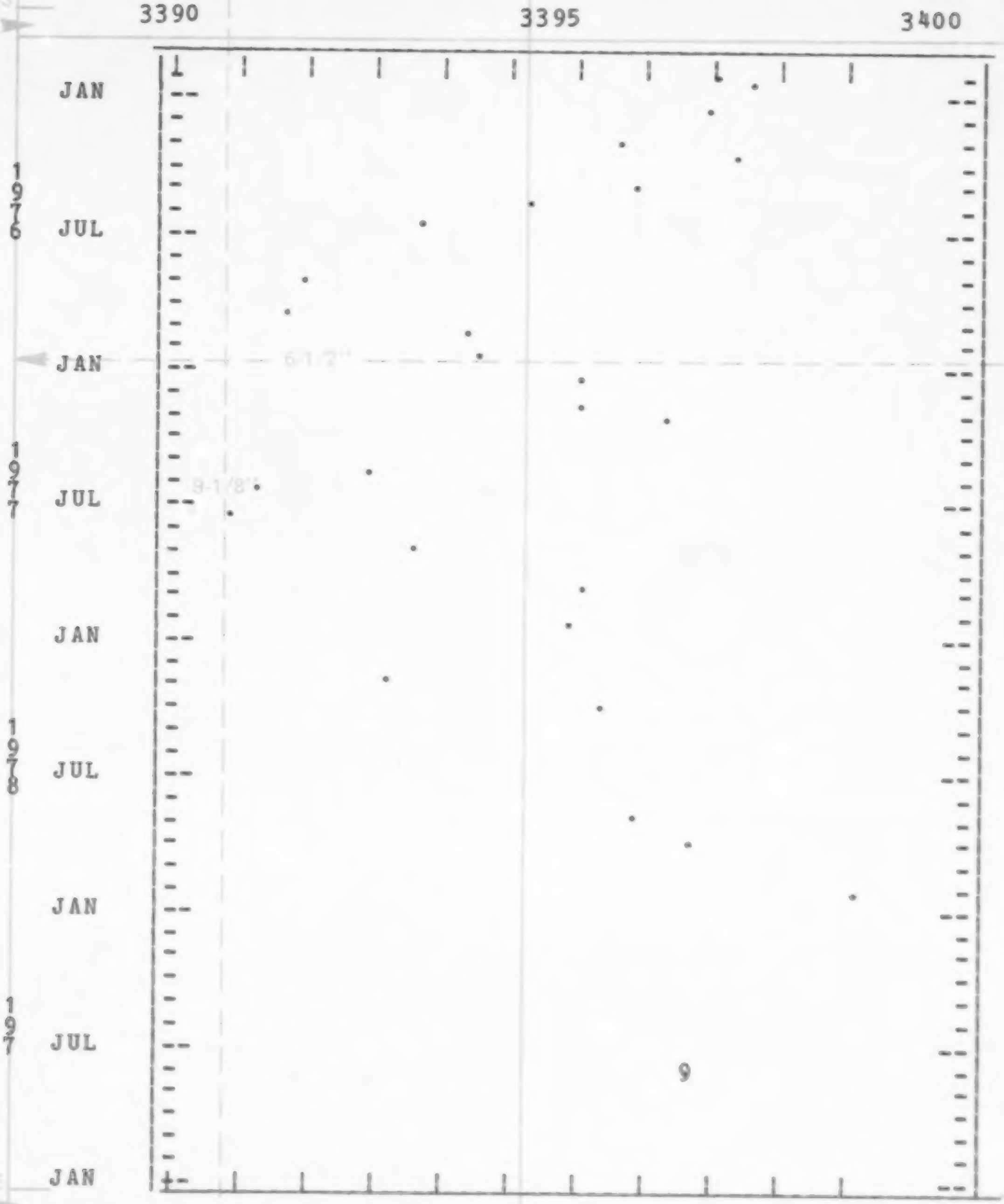
WELL LDCW2

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3460

DATE	LEVEL	READING	CHANGE
11 25 1975	3397.49	62.51	00.00
12 16 1975	3397.98	62.02	-00.49
1 21 1976	3397.37	62.63	00.61
3 5 1976	3396.16	63.84	01.21
3 25 1976	3397.75	62.25	-01.59
5 2 1976	3396.37	63.63	01.38
5 25 1976	3394.92	65.08	01.45
6 21 1976	3393.42	66.58	01.50
9 7 1976	3391.81	68.19	01.61
10 19 1976	3391.58	68.42	00.23
11 15 1976	3394.07	65.93	-02.49
12 16 1976	3394.23	65.77	-00.16
1 19 1977	3395.62	64.38	-01.39
2 21 1977	3395.62	64.38	00.00
3 14 1977	3396.81	63.19	-01.19
4 20 1977	3374.56	85.44	22.25
5 23 1977	3392.71	67.29	-18.15
6 13 1977	3391.18	68.82	01.53
7 20 1977	3390.80	69.20	00.38
8 31 1977	3393.33	66.67	-02.53
9 27 1977	3375.67	84.33	17.66
10 27 1977	3395.67	64.33	-20.00
12 15 1977	3395.48	64.52	00.19
3 1 1978	3392.97	67.03	02.51
4 5 1978	3395.92	64.08	-02.95
8 30 1978	3396.38	63.62	-00.46
10 2 1978	3397.15	62.85	-00.77
12 12 1978	3399.43	60.57	-02.28
3 1 1979	3400.62	59.38	-01.19
6 15 1979	3379.67	80.33	20.95
8 6 1979	3397.14	62.86	-17.47
8 17 1979	3397.15	62.85	-00.01

HYDROGRAPH FOR WELL LDCW2



6-1/2''
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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 2 1 of 2

DATE		062176	092076	092076	031477
POTASSIUM	PPM	15.00	9.00	15.00	10.00
SODIUM	PPM	195	191	145	140
CALCIUM	PPM	250	352	250	199
MAGNESIUM	PPM	180	125	210	180
SULFATE	PPM	1136	1248	1263	930
CHLORIDE	PPM	9.00	13.00	12.00	7.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	775	659	598	756
FLOURIDE	PPM	0.40	0.60	0.70	0.70
SILICON DIO	PPM	15.00	18.00	18.00	17.00
TOTAL P	PPM	0.04	0.01	0.03	0.04
NITRATE	PPM	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.38	0.23	0.38	0.26
SODIUM	EPM	8.48	8.31	6.31	6.09
CALCIUM	EPM	12.47	17.56	12.47	9.93
MAGNESIUM	EPM	14.81	10.28	17.27	14.81
SULFATE	EPM	23.65	25.98	26.30	19.36
CHLORIDE	EPM	0.25	0.37	0.34	0.20
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	12.70	10.80	9.80	12.39
FLOURIDE	EPM	0.02	0.03	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		36.15	36.39	36.44	31.08
TOTAL ANIONS		36.56	37.09	36.38	31.94
DEVIATION		101	102	99.84	103
TDS (calc.)		2167	2262	2189	1839
TDS @180		2225	2355	2403	1938
TOTAL HARDNESS		1364	1391	1486	1236
ALKALINITY		635	540	490	620
NON-CARB HARD		729	851	996	616
LAB CONDUCTIVITY		3400	3125	2700	2100
FIELD COND.					
LAB pH		6.70	7.90	7.70	7.50
FIELD pH		6.60	7.10	6.80	

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 2

2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	12.25	2.77	4.00
SODIUM	PPM	168	25.35	4.00
CALCIUM	PPM	263	55.58	4.00
MAGNESIUM	PPM	174	30.70	4.00
SULFATE	PPM	1144	133	4.00
CHLORIDE	PPM	10.25	2.38	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	697	72.13	4.00
FLOURIDE	PPM	0.60	0.12	4.00
SILICON DIO	PPM	17.00	1.22	4.00
TOTAL P	PPM	0.03	0.01	4.00
NITRATE	PPM	0.00	1.00	4.00
POTASSIUM	EPM	0.31		
SODIUM	EPM	7.30		
CALCIUM	EPM	13.11		
MAGNESIUM	EPM	14.29		
SULFATE	EPM	23.82		
CHLORIDE	EPM	0.29		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	11.42		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		35.01	2.27	4.00
TOTAL ANIONS		35.49	2.07	4.00
DEVIATION		101	1.07	4.00
TDS (calc.)		2114	163	4.00
TDS @180		2230	181	4.00
TOTAL HARDNESS		1369	89.28	4.00
ALKALINITY		571	59.20	4.00
NON-CARB HARD		798	141	4.00
LAB CONDUCTIVITY		2831	490	4.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.45	0.46	4.00
FIELD pH		6.83	0.21	3.00

1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL LDCW3

GROUNDWATER LEVELS (FEET--DATUM MSL)

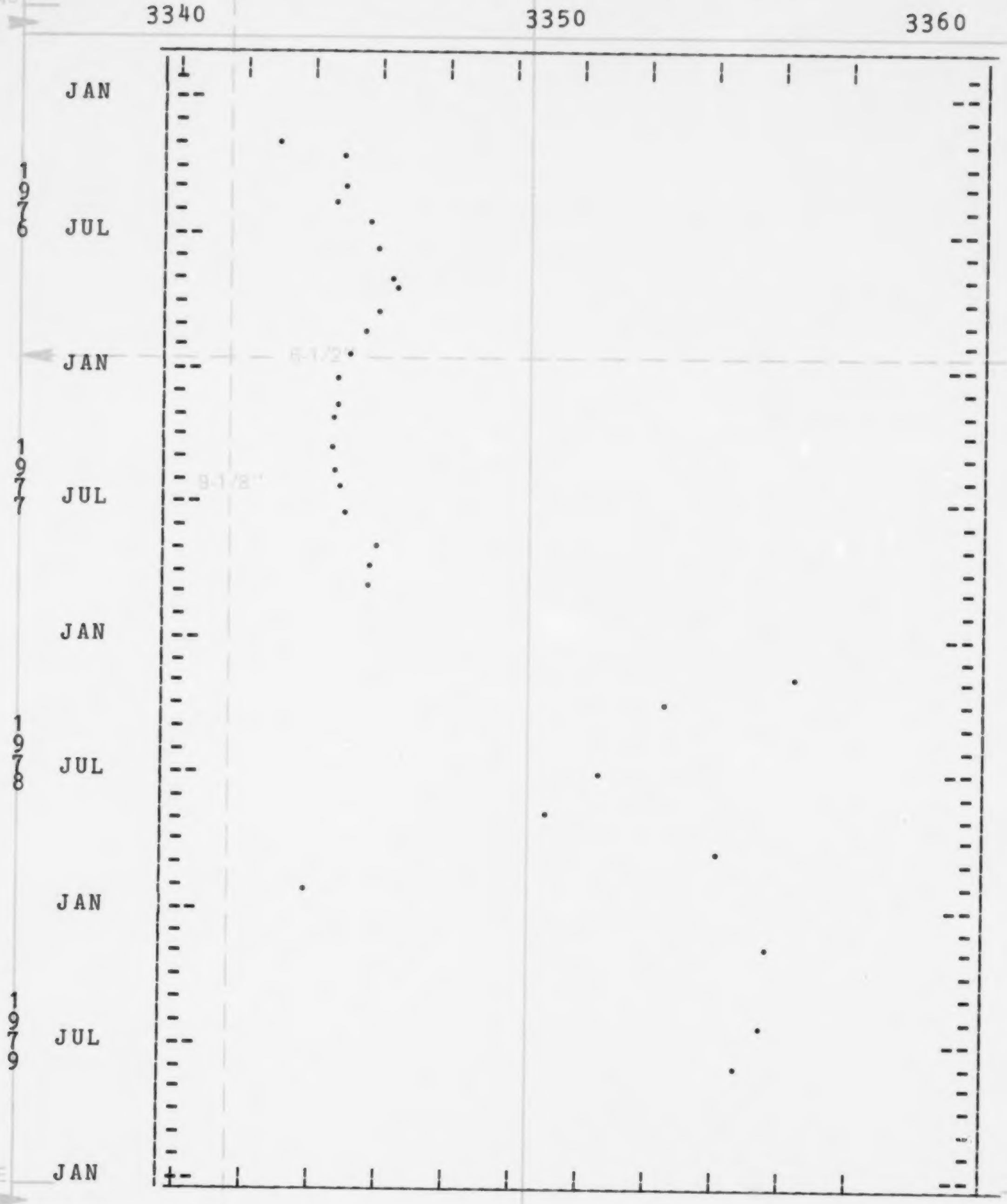
elevation at top of well casing is 3402

DATE	LEVEL	READING	CHANGE
12 11 1975	3331.92	70.08	00.00
1 21 1976	3331.85	70.15	00.07
3 5 1976	3342.79	59.21	-10.94
3 25 1976	3344.58	57.42	-01.79
5 2 1976	3344.61	57.39	-00.03
5 25 1976	3344.33	57.67	00.28
6 21 1976	3345.25	56.75	-00.92
7 29 1976	3345.51	56.49	-00.26
9 7 1976	3345.92	56.08	-00.41
9 20 1976	3346.07	55.93	-00.15
10 19 1976	3345.56	56.44	00.51
11 15 1976	3345.17	56.83	00.39
12 16 1976	3344.75	57.25	00.42
1 19 1977	3344.37	57.63	00.38
2 21 1977	3344.41	57.59	-00.04
3 14 1977	3344.32	57.68	00.09
4 20 1977	3344.26	57.74	00.06
5 23 1977	3344.35	57.65	-00.09
6 13 1977	3344.49	57.51	-00.14
7 20 1977	3344.62	57.38	-00.13
8 31 1977	3345.52	56.48	-00.90
9 27 1977	3345.34	56.66	00.18
10 27 1977	3345.30	56.70	00.04
1 19 1978	3367.73	34.27	-22.43
3 1 1978	3357.10	44.90	10.63
4 5 1978	3353.50	48.50	03.60
7 7 1978	3351.68	50.32	01.82
8 30 1978	3350.25	51.75	01.43
10 23 1978	3354.98	47.02	-04.73
11 25 1978	3332.00	70.00	22.98
12 12 1978	3343.59	58.41	-11.59
3 1 1979	3356.36	45.64	-12.77
6 15 1979	3356.21	45.79	00.15
8 6 1979	3355.50	46.50	00.71
8 17 1979	3355.52	46.48	-00.02

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL LDCW3

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL LDCW #3 (KNOBLOCH COAL AQUIFER) 1 of 3

DATE		121275	032576	062176	092076	092076
POTASSIUM	PPM	10.00	10.00	11.00	10.00	10.00
SODIUM	PPM	120	146	160	159	164
CALCIUM	PPM	68.00	70.00	70.00	162	146
MAGNESIUM	PPM	71.00	73.00	74.00	25.00	34.00
SULFATE	PPM	277	282	304	322	326
CHLORIDE	PPM	4.00	7.00	12.00	11.00	9.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	561	616	604	622	610
FLOURIDE	PPM	1.10	1.10	0.90	0.80	0.90
SILICON DIO	PPM	15.00	8.00	10.00	18.00	16.00
TOTAL P	PPM	0.13	0.10	0.05	0.06	0.02
NITRATE	PPM	3.10	7.00	2.00	3.00	2.00
POTASSIUM	EPM	0.26	0.26	0.28	0.26	0.26
SODIUM	EPM	5.22	6.35	6.96	6.92	7.13
CALCIUM	EPM	3.39	3.49	3.49	8.08	7.29
MAGNESIUM	EPM	5.84	6.00	6.09	2.06	2.80
SULFATE	EPM	5.77	5.87	6.33	6.70	6.79
CHLORIDE	EPM	0.11	0.20	0.34	0.31	0.25
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.19	10.10	9.90	10.19	10.00
FLOURIDE	EPM	0.06	0.06	0.05	0.04	0.05
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.71	16.10	16.82	17.31	17.47
TOTAL ANIONS		15.11	16.17	16.53	17.17	17.02
DEVIATION		103	100	98.25	99.18	97.41
TDS (calc.)		841	891	928	995	989
TDS @180		835	951	930	968	958
TOTAL HARDNESS		461	476	477	508	502
ALKALINITY		460	505	495	510	500
NON-CARB HARD		1.00	0.00	0.00	0.00	2.00
LAB CONDUCTIVITY		1220	1600	1700	1000	1000
FIELD COND.						
LAB pH		7.80	7.90	6.90	8.10	8.30
FIELD pH		6.80	6.60	6.60	7.10	7.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW #3 (KNOBLOCH COAL AQUIFER) 2 of 3

DATE		121676	031477	061377	092777
POTASSIUM	PPM	12.00	10.00	10.00	11.00
SODIUM	PPM	160	180	190	200
CALCIUM	PPM	100.00	86.00	124	66.00
MAGNESIUM	PPM	56.00	64.00	41.00	77.00
SULFATE	PPM	322	336	337	349
CHLORIDE	PPM	7.00	9.00	9.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	598	610	622	671
FLOURIDE	PPM	0.90	1.00	0.96	0.80
SILICON DIO	PPM	15.00	16.00	14.00	19.00
TOTAL P	PPM	0.09	0.02	0.02	0.07
NITRATE	PPM	1.00	2.10	18.20	1.30
POTASSIUM	EPM	0.31	0.26	0.26	0.28
SODIUM	EPM	6.96	7.83	8.26	8.70
CALCIUM	EPM	4.99	4.29	6.19	3.29
MAGNESIUM	EPM	4.61	5.26	3.37	6.33
SULFATE	EPM	6.70	7.00	7.02	7.27
CHLORIDE	EPM	0.20	0.25	0.25	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.80	10.00	10.19	11.00
FLOURIDE	EPM	0.05	0.05	0.05	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		16.86	17.64	18.08	18.61
TOTAL ANIONS		16.70	17.23	17.45	18.54
DEVIATION		99.03	97.69	96.51	99.61
TDS (calc.)		951	985	1017	1044
TDS @180		990	900	1037	1038
TOTAL HARDNESS		481	478	480	481
ALKALINITY		490	500	510	550
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1480	1480	1529	1533
FIELD COND.					1250
LAB pH		8.10	7.80	7.70	8.00
FIELD pH		7.20			7.20

TYPING GUIDE SHEET
EPA-287 (Cin.)
(4-76)

WELL LDCW #3 (KNOBLOCH COAL AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	10.44	0.68	9.00
SODIUM	PPM	164	22.47	9.00
CALCIUM	PPM	99.11	34.49	9.00
MAGNESIUM	PPM	57.22	18.26	9.00
SULFATE	PPM	317	23.36	9.00
CHLORIDE	PPM	8.78	2.35	9.00
CARBONATE	PPM	0.00	0.00	9.00
BICARBONATE	PPM	613	27.00	9.00
FLOURIDE	PPM	0.94	0.10	9.00
SILICON DIO	PPM	14.56	3.34	9.00
TOTAL P	PPM	0.04	0.06	9.00
NITRATE	PPM	4.41	5.15	9.00
POTASSIUM	EPM	0.27		
SODIUM	EPM	7.15		
CALCIUM	EPM	4.95		
MAGNESIUM	EPM	4.71		
SULFATE	EPM	6.60		
CHLORIDE	EPM	0.25		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	10.04		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		17.07	1.08	9.00
TOTAL ANIONS		16.88	0.89	9.00
DEVIATION		98.97	1.73	9.00
TDS (calc.)		960	60.57	9.00
TDS @180		956	60.61	9.00
TOTAL HARDNESS		483	13.32	9.00
ALKALINITY		502	22.13	9.00
NON-CARB HARD		0.33	0.67	9.00
LAB CONDUCTIVITY		1394	242	9.00
FIELD COND.		1250	0.00	1.00
LAB pH		7.84	0.38	9.00
FIELD pH		6.93	0.24	7.00

EPA-287 (Cin.)
(4-76)

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TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD: BEGIN SECTIONS HERE
6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

WELL LDCW4

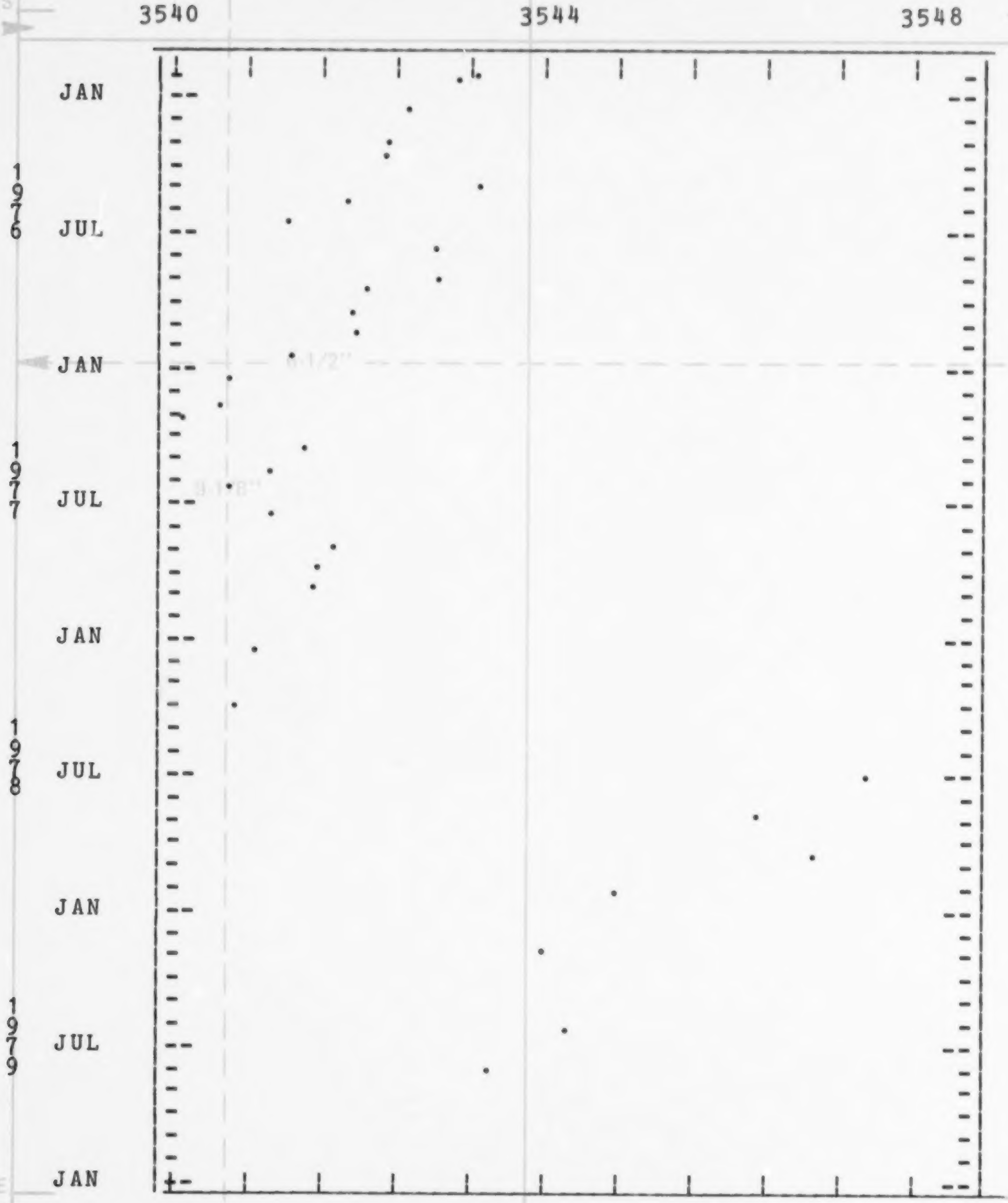
GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3556

DATE	LEVEL	READING	CHANGE
11 25 1975	3543.06	12.94	00.00
12 11 1975	3542.88	13.12	00.18
1 21 1976	3542.36	13.64	00.52
3 5 1976	3542.17	13.83	00.19
3 25 1976	3542.14	13.86	00.03
5 2 1976	3543.08	12.92	-00.94
5 25 1976	3541.75	14.25	01.33
6 21 1976	3541.16	14.84	00.59
7 29 1976	3542.65	13.35	-01.49
9 7 1976	3542.68	13.32	-00.03
9 20 1976	3541.96	14.04	00.72
10 19 1976	3541.81	14.19	00.15
11 15 1976	3541.85	14.15	-00.04
12 16 1976	3541.19	14.81	00.66
1 19 1977	3540.56	15.44	00.63
2 21 1977	3540.48	15.52	00.08
3 14 1977	3540.10	15.90	00.38
4 20 1977	3541.32	14.68	-01.22
5 23 1977	3540.98	15.02	00.34
6 13 1977	3540.57	15.43	00.41
7 20 1977	3540.99	15.01	-00.42
8 31 1977	3541.62	14.38	-00.63
9 27 1977	3541.46	14.54	00.16
10 27 1977	3541.42	14.58	00.04
1 19 1978	3540.83	15.17	00.59
4 5 1978	3540.64	15.36	00.19
7 7 1978	3547.00	9.00	-06.36
8 30 1978	3545.90	10.10	01.10
10 23 1978	3546.47	9.53	-00.57
12 12 1978	3544.48	11.52	01.99
3 1 1979	3543.74	12.26	00.74
6 15 1979	3543.98	12.02	-00.24
8 6 1979	3543.20	12.80	00.78
8 17 1979	3540.26	15.74	02.94

HYDROGRAPH FOR WELL LDCW4

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL LDCW 4 (SAWYER COAL AQUIFER) 1 of 3

DATE		121275	032576	062176	092176	092176
POTASSIUM	PPM	14.00	5.00	10.00	8.00	8.00
SODIUM	PPM	275	180	255	260	268
CALCIUM	PPM	88.00	84.00	101	228	230
MAGNESIUM	PPM	84.00	83.00	103	14.00	14.00
SULFATE	PPM	712	352	734	742	770
CHLORIDE	PPM	5.00	11.00	8.00	6.00	7.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	586	683	573	573	561
FLOURIDE	PPM	1.90	2.30	1.50	1.90	1.70
SILICON DIO	PPM	10.00	8.00	12.00	9.00	10.00
TOTAL P	PPM	0.15	0.10	0.05	0.01	0.01
NITRATE	PPM	0.80	1.00	1.00	1.00	3.00
POTASSIUM	EPM	0.36	0.13	0.26	0.20	0.20
SODIUM	EPM	11.96	7.83	11.09	11.31	11.66
CALCIUM	EPM	4.39	4.19	5.04	11.38	11.48
MAGNESIUM	EPM	6.91	6.83	8.47	1.15	1.15
SULFATE	EPM	14.82	7.33	15.28	15.45	16.03
CHLORIDE	EPM	0.14	0.31	0.23	0.17	0.20
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.60	11.19	9.39	9.39	9.19
FLOURIDE	EPM	0.10	0.12	0.08	0.10	0.09
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		23.62	18.98	24.86	24.04	24.49
TOTAL ANIONS		24.63	18.87	24.92	25.06	25.46
DEVIATION		104	99.44	100	104	104
TDS (calc.)		1476	1051	1493	1540	1573
TDS @180		1527	1532	1379	1557	1491
TOTAL HARDNESS		565	551	674	628	633
ALKALINITY		480	560	470	470	460
NON-CARB HARD		85.00	0.00	204	158	173
LAB CONDUCTIVITY		1961	2500	2500	2200	2000
FIELD COND.						
LAB pH		8.20	7.80	7.00	8.10	8.10
FIELD pH		7.50	7.80	6.60		7.10

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL LDCW 4 (SAWYER COAL AQUIFER) 2 of 3

DATE		121676	031477	061377	092777	121577
POTASSIUM	PPM	11.00	10.00	8.00	12.00	10.00
SODIUM	PPM	250	280	300	300	323
CALCIUM	PPM	220	164	1130	87.00	66.00
MAGNESIUM	PPM	12.00	36.00	69.00	86.00	79.00
SULFATE	PPM	709	684	728	713	765
CHLORIDE	PPM	7.00	6.00	8.00	9.00	9.00
CARBONATE	PPM	12.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	519	573	561	592	488
FLOURIDE	PPM	1.10	2.20	2.00	1.60	1.90
SILICON DIO	PPM	8.00	10.00	12.00	10.00	10.00
TOTAL P	PPM	0.20	0.01	0.07	0.09	0.01
NITRATE	PPM	4.20	0.20	0.10	0.10	0.10
POTASSIUM	EPM	0.28	0.26	0.20	0.31	0.26
SODIUM	EPM	10.87	12.18	13.05	13.05	14.05
CALCIUM	EPM	10.98	8.18	56.39	4.34	3.29
MAGNESIUM	EPM	0.99	2.96	5.68	7.07	6.50
SULFATE	EPM	14.76	14.24	15.16	14.84	15.93
CHLORIDE	EPM	0.20	0.17	0.23	0.25	0.25
CARBONATE	EPM	0.40	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.51	9.39	9.19	9.70	8.00
FLOURIDE	EPM	0.06	0.12	0.11	0.08	0.10
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		23.12	23.58	75.32	24.77	24.10
TOTAL ANIONS		23.87	23.87	24.62	24.82	24.21
DEVIATION		103	101	32.69	100	100
TDS (calc.)		1476	1462	1519	1498	1492
TDS @180		1479	1440	1460	1503	1542
TOTAL HARDNESS		598	558	606	572	490
ALKALINITY		445	470	460	485	400
NON-CARB HARD		153	88.00	146	87.00	90.00
LAB CONDUCTIVITY		2150	1850	2156	2037	2195
FIELD COND.					1600	1450
LAB pH		7.20	7.50	7.50	7.90	7.70
FIELD pH		6.70			7.40	7.28

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 4 (SAWYER COAL AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	9.60	2.37	10.00
SODIUM	PPM	269	36.82	10.00
CALCIUM	PPM	240	303	10.00
MAGNESIUM	PPM	58.00	33.38	10.00
SULFATE	PPM	691	116	10.00
CHLORIDE	PPM	7.60	1.69	10.00
CARBONATE	PPM	1.20	3.60	10.00
BICARBONATE	PPM	571	47.97	10.00
FLOURIDE	PPM	1.81	0.33	10.00
SILICON DIO	PPM	9.90	1.30	10.00
TOTAL P	PPM	0.04	0.08	10.00
NITRATE	PPM	0.69	1.60	10.00
POTASSIUM	EPM	0.25		
SODIUM	EPM	11.71		
CALCIUM	EPM	11.97		
MAGNESIUM	EPM	4.77		
SULFATE	EPM	14.38		
CHLORIDE	EPM	0.21		
CARBONATE	EPM	0.04		
BICARBONATE	EPM	9.36		
FLOURIDE	EPM	0.10		
NITRATE	EPM	0.00		
TOTAL CATIONS		28.69	15.63	10.00
TOTAL ANIONS		24.04	1.79	10.00
DEVIATION		95.00	20.85	10.00
TDS (calc.)		1458	139	10.00
TDS @180		1491	51.30	10.00
TOTAL HARDNESS		587	49.09	10.00
ALKALINITY		470	37.62	10.00
NON-CARB HARD		118	56.29	10.00
LAB CONDUCTIVITY		2155	203	10.00
FIELD COND.		1525	75.00	2.00
LAB pH		7.70	0.38	10.00
FIELD pH		7.20	0.40	7.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW5

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3300

DATE	LEVEL	READING	CHANGE
10 19 1976	3220.97	79.03	00.00
11 15 1976	3218.24	81.76	02.73
12 16 1976	3220.37	79.63	-02.13
1 19 1977	3221.09	78.91	-00.72
2 21 1977	3221.29	78.71	-00.20
3 15 1977	3220.94	79.06	00.35
4 20 1977	3223.19	76.81	-02.25
5 23 1977	3224.23	75.77	-01.04
6 13 1977	3223.80	76.20	00.43
7 20 1977	3219.24	80.76	04.56
8 31 1977	3221.92	78.08	-02.68
9 27 1977	3212.10	87.90	09.82
10 27 1977	3221.53	78.47	-09.43
12 20 1977	3221.32	78.68	00.21
1 19 1978	3221.19	78.81	00.13
3 1 1978	3220.51	79.49	00.68
4 5 1978	3218.97	81.03	01.54
7 7 1978	3223.80	76.20	-04.83
8 11 1978	3222.94	77.06	00.86
9 6 1978	3221.68	78.32	01.26
10 23 1978	3218.81	81.19	02.87
12 12 1978	3221.86	78.14	-03.05
3 1 1979	3221.76	78.24	00.10
6 15 1979	3218.72	81.28	03.04
8 6 1979	3223.57	76.43	-04.85
8 17 1979	3222.43	77.57	01.14

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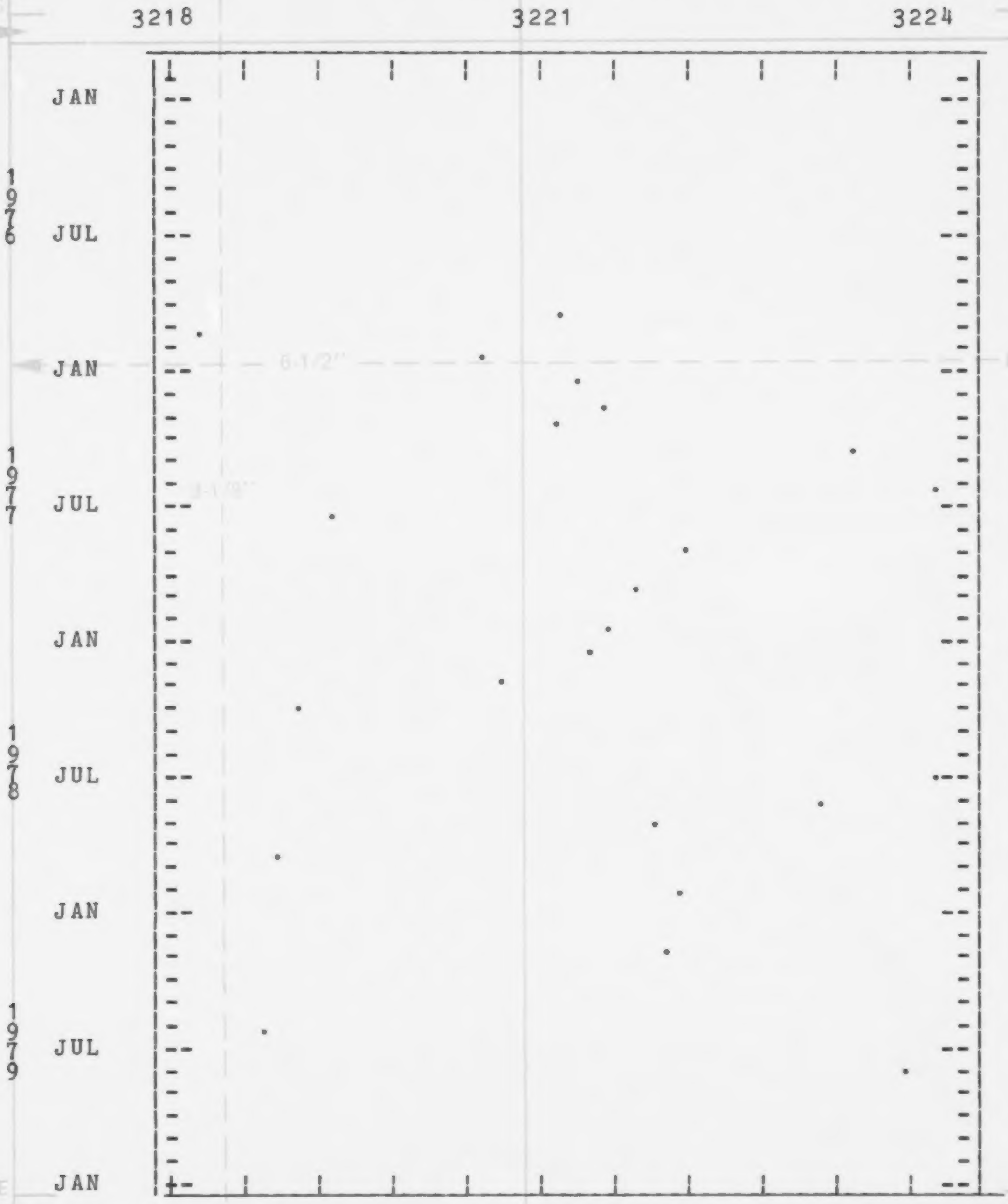
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL LDCW5



6-1/2"
3-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 5 1 of 2

DATE		092176	092176	121676	031577	061377
POTASSIUM	PPM	8.00	8.00	10.00	10.00	7.00
SODIUM	PPM	62.00	62.00	50.00	60.00	68.00
CALCIUM	PPM	124	120	98.00	86.00	99.00
MAGNESIUM	PPM	35.00	40.00	52.00	59.00	54.00
SULFATE	PPM	156	166	161	156	162
CHLORIDE	PPM	8.00	11.00	6.00	6.00	8.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	512	525	512	488	512
FLOURIDE	PPM	1.10	6.70	1.00	1.20	1.10
SILICON DIO	PPM	19.00	19.00	17.00	20.00	20.00
TOTAL P	PPM	0.07	0.02	0.04	0.01	0.01
NITRATE	PPM	1.00	1.00	1.00	0.20	0.20
POTASSIUM	EPM	0.20	0.20	0.26	0.26	0.18
SODIUM	EPM	2.70	2.70	2.18	2.61	2.96
CALCIUM	EPM	6.19	5.99	4.89	4.29	4.94
MAGNESIUM	EPM	2.88	3.29	4.28	4.85	4.44
SULFATE	EPM	3.25	3.46	3.35	3.25	3.37
CHLORIDE	EPM	0.23	0.31	0.17	0.17	0.23
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.39	8.60	8.39	8.00	8.39
FLOURIDE	EPM	0.06	0.35	0.05	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.97	12.18	11.60	12.01	12.52
TOTAL ANIONS		11.87	12.64	11.92	11.43	11.99
DEVIATION		99.14	104	103	95.20	95.77
TDS (calc.)		645	665	629	617	650
TDS @180		635	6618	651	633	680
TOTAL HARDNESS		452	462	456	454	469
ALKALINITY		420	430	420	400	420
NON-CARB HARD		32.00	32.00	36.00	54.00	49.00
LAB CONDUCTIVITY		1010	1000	1100	1040	1078
FIELD COND.						
LAB pH		8.10	8.10	7.70	7.80	7.40
FIELD pH		7.50	6.80	6.50	6.80	

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
8-1/2''
9-1/8''
3/8''
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL LDCW 5 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	8.60	1.20	5.00
SODIUM	PPM	60.40	5.85	5.00
CALCIUM	PPM	105	14.36	5.00
MAGNESIUM	PPM	48.00	9.01	5.00
SULFATE	PPM	160	3.82	5.00
CHLORIDE	PPM	7.80	1.83	5.00
CARBONATE	PPM	0.00	0.00	5.00
BICARBONATE	PPM	510	12.01	5.00
FLOURIDE	PPM	2.22	2.24	5.00
SILICON DIO	PPM	19.00	1.10	5.00
TOTAL P	PPM	0.03	0.03	5.00
NITRATE	PPM	0.28	0.73	5.00
POTASSIUM	EPM	0.22		
SODIUM	EPM	2.63		
CALCIUM	EPM	5.26		
MAGNESIUM	EPM	3.95		
SULFATE	EPM	3.34		
CHLORIDE	EPM	0.22		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	8.36		
FLOURIDE	EPM	0.12		
NITRATE	EPM	0.00		
TOTAL CATIONS		12.06	0.30	5.00
TOTAL ANIONS		11.97	0.39	5.00
DEVIATION		99.34	3.51	5.00
TDS (calc.)		641	16.69	5.00
TDS @180		1843	2387	5.00
TOTAL HARDNESS		459	6.18	5.00
ALKALINITY		418	9.80	5.00
NON-CARB HARD		40.60	9.16	5.00
LAB CONDUCTIVITY		1046	38.44	5.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.82	0.26	5.00
FIELD pH		6.90	0.37	4.00

8-1/2"
6-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL LDCW6

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3215

DATE	LEVEL	READING	CHANGE
11 25 1975	3188.93	26.07	00.00
12 11 1975	3189.11	25.89	-00.18
1 21 1976	3189.36	25.64	-00.25
3 5 1976	3189.27	25.73	00.09
3 26 1976	3188.78	26.22	00.49
5 2 1976	3189.19	25.81	-00.41
5 25 1976	3189.73	25.27	-00.54
6 21 1976	3188.81	26.19	00.92
7 29 1976	3188.30	26.70	00.51
9 7 1976	3187.73	27.27	00.57
9 20 1976	3187.70	27.30	00.03
10 20 1976	3188.29	26.71	-00.59
11 15 1976	3187.32	27.68	00.97
12 16 1976	3190.63	24.37	-03.31
1 19 1977	3187.00	28.00	03.63
2 21 1977	3188.40	26.60	-01.40
3 15 1977	3188.51	26.49	-00.11
4 20 1977	3189.00	26.00	-00.49
5 23 1977	3189.03	25.97	-00.03
6 13 1977	3188.25	26.75	00.78
7 20 1977	3187.90	27.10	00.35
8 31 1977	3187.58	27.42	00.32
9 27 1977	3188.11	26.89	-00.53
10 27 1977	3188.66	26.34	-00.55
12 20 1977	3188.89	26.11	-00.23
1 19 1978	3188.23	26.77	00.66
3 1 1978	3187.23	27.77	01.00
4 5 1978	3188.78	26.22	-01.55
7 7 1978	3189.34	25.66	-00.56
8 11 1978	3189.17	25.83	00.17
9 6 1978	3188.89	26.11	00.28
10 23 1978	3188.23	26.77	00.66
3 1 1979	3189.62	25.38	-01.39
3 22 1979	3190.80	24.20	-01.18
6 15 1979	3189.92	25.08	00.88
8 6 1979	3188.46	26.54	01.46
8 17 1979	3188.79	26.21	-00.33

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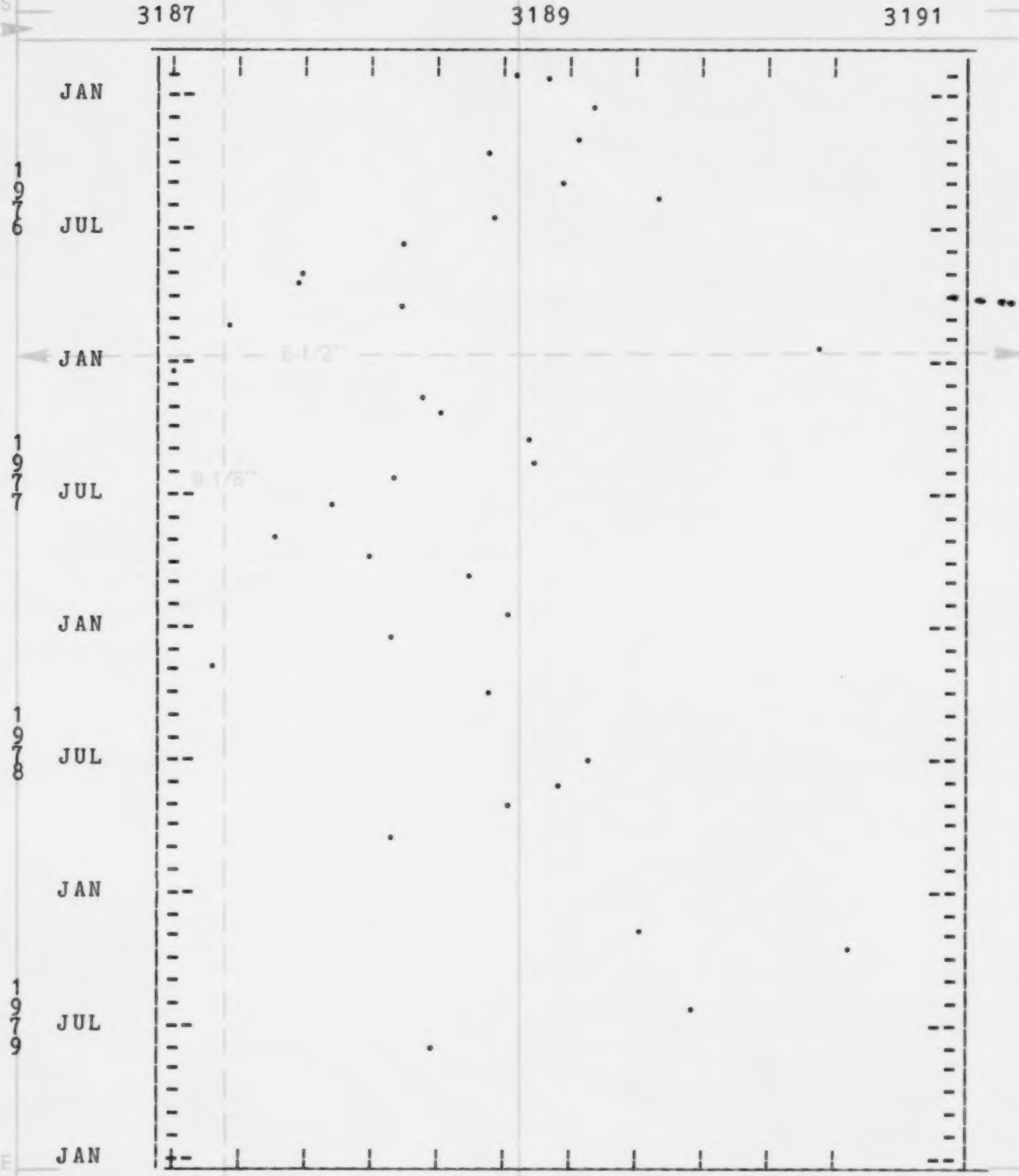
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL LDCW6

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL LDCW 6 (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		121275	032576	062176	092176	092176
POTASSIUM	PPM	11.00	9.00	8.00	10.00	11.00
SODIUM	PPM	55.00	52.00	60.00	71.00	91.00
CALCIUM	PPM	79.00	80.00	77.00	132	136
MAGNESIUM	PPM	61.00	75.00	66.00	48.00	47.00
SULFATE	PPM	156	166	152	230	288
CHLORIDE	PPM	6.00	8.00	6.00	11.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	519	531	525	573	561
FLOURIDE	PPM	1.10	1.00	1.00	1.20	1.10
SILICON DIO	PPM	15.00	11.00	8.00	31.00	28.00
TOTAL P	PPM	0.09	0.10	0.07	0.02	0.02
NITRATE	PPM	0.60	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.28	0.23	0.20	0.26	0.28
SODIUM	EPM	2.39	2.26	2.61	3.09	3.96
CALCIUM	EPM	3.94	3.99	3.84	6.59	6.79
MAGNESIUM	EPM	5.02	6.17	5.43	3.95	3.87
SULFATE	EPM	3.25	3.46	3.16	4.79	6.00
CHLORIDE	EPM	0.17	0.23	0.17	0.31	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.51	8.70	8.60	9.39	9.19
FLOURIDE	EPM	0.06	0.05	0.05	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		11.63	12.65	12.09	13.88	14.89
TOTAL ANIONS		11.94	12.38	11.95	14.47	15.46
DEVIATION		103	97.81	98.86	104	104
TDS (calc.)		638	651	627	784	859
TDS @180		637	650	668	756	780
TOTAL HARDNESS		447	509	460	526	531
ALKALINITY		425	435	430	470	460
NON-CARB HARD		22.00	74.00	30.00	56.00	71.00
LAB CONDUCTIVITY		935	1000	1100	1176	1000
FIELD COND.						
LAB pH		7.90	6.90	7.50	8.30	8.20
FIELD pH		6.80	6.70	6.50	6.30	6.80

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL LDCW 6 (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		031577	MEAN	ST.DEV	#
POTASSIUM	PPM	14.00	10.50	1.89	6.00
SODIUM	PPM	70.00	66.50	13.02	6.00
CALCIUM	PPM	129	105	26.92	6.00
MAGNESIUM	PPM	54.00	58.50	9.98	6.00
SULFATE	PPM	225	203	49.36	6.00
CHLORIDE	PPM	9.00	8.33	1.89	6.00
CARBONATE	PPM	0.00	0.00	0.00	6.00
BICARBONATE	PPM	549	543	19.60	6.00
FLOURIDE	PPM	1.40	1.13	0.14	6.00
SILICON DIO	PPM	29.00	20.33	9.27	6.00
TOTAL P	PPM	0.06	0.03	0.06	6.00
NITRATE	PPM	0.10	0.55	0.65	6.00
POTASSIUM	EPM	0.36	0.27		
SODIUM	EPM	3.05	2.89		
CALCIUM	EPM	6.44	5.26		
MAGNESIUM	EPM	4.44	4.81		
SULFATE	EPM	4.68	4.22		
CHLORIDE	EPM	0.25	0.24		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	9.00	8.90		
FLOURIDE	EPM	0.07	0.06		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		14.28	13.24	1.19	6.00
TOTAL ANIONS		13.94	13.36	1.35	6.00
DEVIATION		97.64	101	2.80	6.00
TDS (calc.)		771	722	87.69	6.00
TDS @180		744	706	55.92	6.00
TOTAL HARDNESS		542	502	36.18	6.00
ALKALINITY		450	445	16.33	6.00
NON-CARB HARD		92.00	57.50	24.71	6.00
LAB CONDUCTIVITY		1230	1073	105	6.00
FIELD COND.			0.00	0.00	0.00
LAB pH		7.80	7.77	0.47	6.00
FIELD pH		7.20	6.72	0.28	6.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW7

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3740

DATE	LEVEL	READING	CHANGE
1 21 1976	3663.85	76.15	00.00
3 5 1976	3663.83	76.17	00.02
3 25 1976	3663.88	76.12	-00.05
5 2 1976	3662.51	77.49	01.37
5 25 1976	3663.46	76.54	-00.95
6 21 1976	3662.46	77.54	01.00
7 29 1976	3663.61	76.39	-01.15
9 7 1976	3662.43	77.57	01.18
9 20 1976	3663.04	76.96	-00.61
10 19 1976	3663.16	76.84	-00.12
11 15 1976	3663.34	76.66	-00.18
1 19 1977	3662.86	77.14	00.48
2 21 1977	3664.80	75.20	-01.94
3 15 1977	3662.84	77.16	01.96
4 20 1977	3663.35	76.65	-00.51
5 25 1977	3663.68	76.32	-00.33
6 13 1977	3662.96	77.04	00.72
7 20 1977	3732.89	7.11	-69.93
8 31 1977	3662.71	77.29	70.18
9 27 1977	3662.70	77.30	00.01
10 27 1977	3662.63	77.37	00.07
1 19 1978	3662.61	77.39	00.02
3 1 1978	3663.50	76.50	-00.89
4 5 1978	3662.56	77.44	00.94
9 6 1978	3664.17	75.83	-01.61
10 23 1978	3664.52	75.48	-00.35
12 12 1978	3674.08	65.92	-09.56
3 1 1979	3673.41	66.59	00.67
6 15 1979	3675.78	64.22	-02.37
8 6 1979	3664.41	75.59	11.37
8 17 1979	3664.32	75.68	00.09

6-1/2"
9-1/8"
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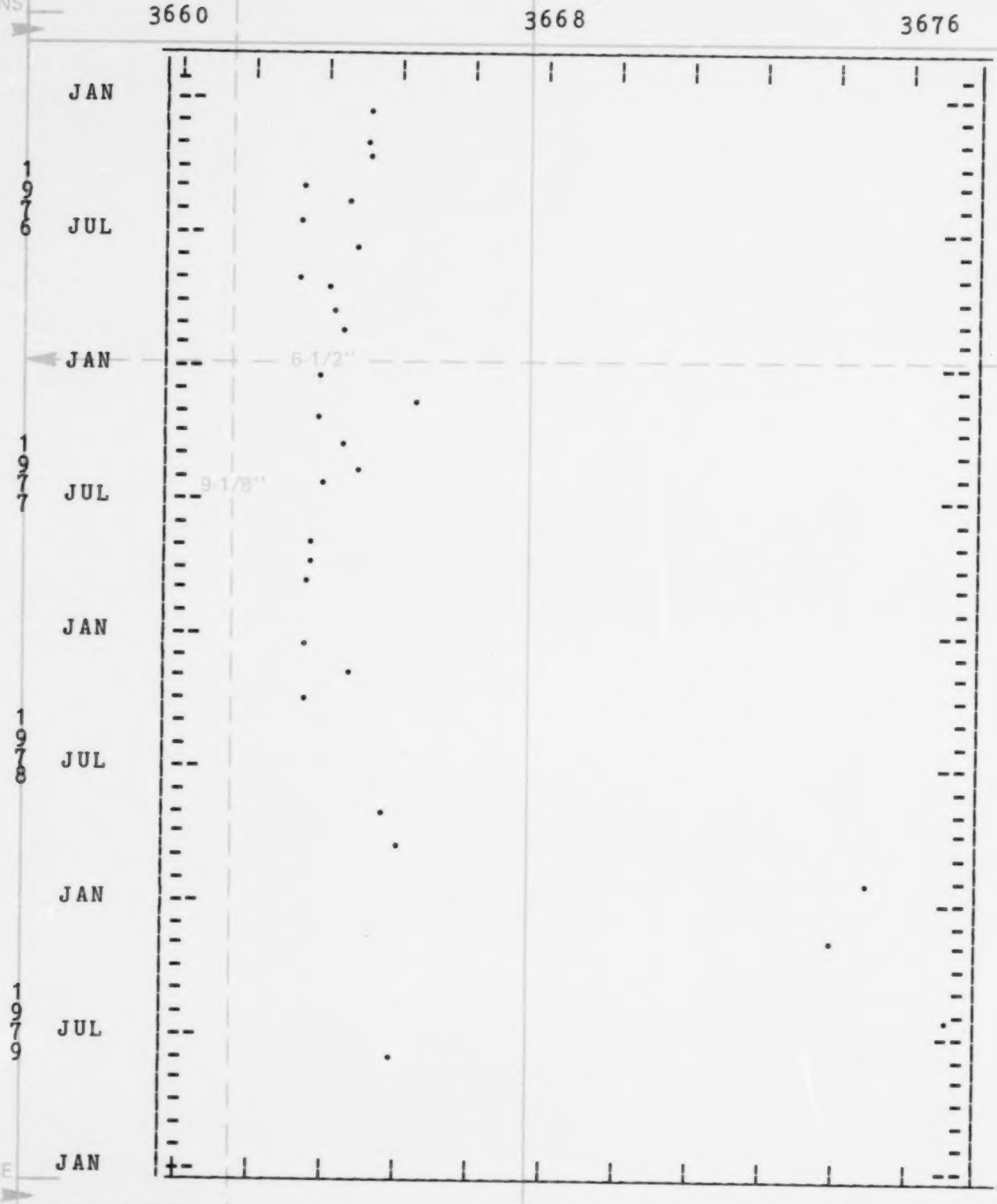
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL LDCW7

WATER LEVEL (FEET ABOVE MSL)



6-1/2''

9-1/8''

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8''

EPA-287 (Cin.)
(4-76)

WELL LDCW 7 1 of 3

DATE		121775	032576	032576	062176	092176
POTASSIUM	PPM	5.00	5.00	5.00	5.00	
SODIUM	PPM	48.00	35.00	35.00	50.00	
CALCIUM	PPM	60.00	59.00	59.00	63.00	
MAGNESIUM	PPM	48.00	52.00	52.00	49.00	
SULFATE	PPM	75.00	72.00	72.00	77.00	
CHLORIDE	PPM	5.00	10.00	10.00	5.00	
CARBONATE	PPM	0.00	0.00	0.00	0.00	
BICARBONATE	PPM	458	42.00	42.00	476	
FLOURIDE	PPM	1.20	1.10	1.10	1.00	
SILICON DIO	PPM	8.00	14.00	14.00	12.00	
TOTAL P	PPM	0.31	0.10	0.10	0.03	
NITRATE	PPM	2.20	1.00	1.00	1.00	
POTASSIUM	EPM	0.13	0.13	0.13	0.13	
SODIUM	EPM	2.09	1.52	1.52	2.18	
CALCIUM	EPM	2.99	2.94	2.94	3.14	
MAGNESIUM	EPM	3.95	4.28	4.28	4.03	
SULFATE	EPM	1.56	1.50	1.50	1.60	
CHLORIDE	EPM	0.14	0.28	0.28	0.14	
CARBONATE	EPM	0.00	0.00	0.00	0.00	
BICARBONATE	EPM	7.51	0.69	0.69	7.80	
FLOURIDE	EPM	0.06	0.06	0.06	0.05	
NITRATE	EPM	0.01	0.00	0.00	0.00	
TOTAL CATIONS		9.16	8.87	8.87	9.48	201
TOTAL ANIONS		9.24	2.45	2.45	9.56	160
DEVIATION		101	27.64	27.64	101	79.57
TDS (calc.)		454	443	443	483	
TDS @180		401	502	502	476	
TOTAL HARDNESS		347	360	360	359	
ALKALINITY		375	350	350	390	
NON-CARB HARD		0.00	10.00	10.00	0.00	
LAB CONDUCTIVITY		735	850	850	800	
FIELD COND.						
LAB pH		7.80	7.20	7.20	6.90	
FIELD pH		6.90	8.10	8.10	6.40	6.20

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 7 2 of 3

DATE		092176	011177	031577	061377
POTASSIUM	PPM	6.00	6.00	5.00	5.00
SODIUM	PPM	47.00	44.00	46.00	52.00
CALCIUM	PPM	90.00	64.00	78.00	91.00
MAGNESIUM	PPM	38.00	50.00	44.00	31.00
SULFATE	PPM	76.00	74.00	74.00	69.00
CHLORIDE	PPM	9.00	5.00	4.00	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	500	464	476	464
FLOURIDE	PPM	1.10	1.20	1.20	1.10
SILICON DIO	PPM	19.00	8.00	21.00	17.00
TOTAL P	PPM	0.01	0.02	0.01	0.13
NITRATE	PPM	1.00	1.00	0.40	0.80
POTASSIUM	EPM	0.15	0.15	0.13	0.13
SODIUM	EPM	2.04	1.91	2.00	2.26
CALCIUM	EPM	4.49	3.19	3.89	4.54
MAGNESIUM	EPM	3.13	4.11	3.62	2.55
SULFATE	EPM	1.58	1.54	1.54	1.44
CHLORIDE	EPM	0.25	0.14	0.11	0.17
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.19	7.60	7.80	7.60
FLOURIDE	EPM	0.06	0.06	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		9.81	9.37	9.64	9.48
TOTAL ANIONS		10.02	9.31	9.49	9.23
DEVIATION		102	99.35	98.42	97.32
TDS (calc.)		512	471	485	482
TDS @180		463	537	422	516
TOTAL HARDNESS		382	367	377	352
ALKALINITY		410	380	390	380
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		833	860	860	882
FIELD COND.					
LAB pH		8.10	7.80	8.00	7.60
FIELD pH		6.40	7.40		

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL LDCW 7 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	5.25	0.43	8.00
SODIUM	PPM	44.62	6.00	8.00
CALCIUM	PPM	70.50	12.89	8.00
MAGNESIUM	PPM	45.50	7.00	8.00
SULFATE	PPM	73.62	2.39	8.00
CHLORIDE	PPM	6.75	2.33	8.00
CARBONATE	PPM	0.00	0.00	8.00
BICARBONATE	PPM	365	187	8.00
FLOURIDE	PPM	1.12	0.07	8.00
SILICON DIO	PPM	14.12	4.46	8.00
TOTAL P	PPM	0.03	0.13	8.00
NITRATE	PPM	0.05	1.15	8.00
POTASSIUM	EPM	0.13		
SODIUM	EPM	1.94		
CALCIUM	EPM	3.52		
MAGNESIUM	EPM	3.74		
SULFATE	EPM	1.53		
CHLORIDE	EPM	0.19		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	5.99		
FLOURIDE	EPM	0.06		
NITRATE	EPM	0.00		
TOTAL CATIONS		30.64	60.24	9.00
TOTAL ANIONS		24.64	47.93	9.00
DEVIATION		81.54	29.51	9.00
TDS (calc.)		472	22.35	8.00
TDS @180		477	43.83	8.00
TOTAL HARDNESS		363	11.09	8.00
ALKALINITY		378	19.03	8.00
NON-CARB HARD		2.50	4.33	8.00
LAB CONDUCTIVITY		834	43.48	8.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.58	0.40	8.00
FIELD pH		7.07	0.75	7.00

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #35 AB
Date Completed 6/30/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-20'	20'	Sand, Brown, Fine, Dry
20'-28'	8'	Sand, Fine, Brown, Gravelly
28'-35.5'	7.5'	Sand, Gravelly, Greenish-Brown
35.5'-36'	.5'	Sandstone, Yellowish-Brown, Hard Streak
36'-41'	5'	Sand, Brown, Gravelly
41'-42'	1'	Shale, Gray
42'-43.5'	1.5'	Coal, Dirty
43.5'-48'	4.5'	Shale, Gray
48'-49'	1'	Sandstone
49'-61.5'	12.5'	Shale, Gray
61.5'-62'	.5'	Sandstone, Hard
62'-74'	12'	Sandstone, Soft, Brownish, H_2O 20 gal./min.
74'-75'	1'	Shale, Gray
75'-79'	4'	Coal
79'-83'	4'	Sandstone, Gray
83'-87'	4'	Shale, Gray
87'-89'	2'	Coal

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#35 AB continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
89'-104'	15'	Shale, Gray
104'-109'	5'	Coal
109'-116'	7'	Shale, Gray
116'-123'	7'	Sandstone, Fine, Gray
123'-126'	3'	Shale, Gray
126'-126.5'	.5'	Sandstone, Streak
126.5'-134'	7.5'	Shale, Gray
134'-137'	3'	Coal-H_2O 2 Gal./Min.
137'-147'	10'	Shale, Gray, Silty
147'-148'	1'	Coal
148'-158'	10'	Shale, Gray, Silty
158'-161'	3'	Coal, Dirty
161'-166'	5'	Sandstone, Gray, Fine
166'-174'	8'	Sandstone, Hard, Reddish Brown, Grading to Gray
174'-177'	3'	Shale, Gray
177'-181'	4'	Siltstone, Gray
181'-187'	6'	Shale, Dark Gray
187'-187.5'	.5'	Sandstone, Streak
187.5'-192'	4.5'	Shale, Dark Gray
192'-197'	-5	Shale, Gray

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#35 AB continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
197'-197.5'	5'	Clay, Sticky
197.5'-208'	10.5'	Shale, Gray
208'-216'	8'	Conglomerate, Sticky Clay w/sand and shaly gravel
216'-228'	12'	Sandstone, Fine, Gray
228'-232'	4'	Sandstone, w/soft organic rich clay layers
232'-241'	9'	Sandstone, Soft, Gray, Fine
241'-263'	22'	Sandstone, Soft, Yellowish Brown
263'-274'	11'	Shale, Gray
274'-278'	4'	Sandstone, Gray, w/coal Streaks
287'-293'	15'	Coal w/Gray Shale Partings (Robinson)
293'-297'	4'	Shale, Gray?=298' Silt, Gray?

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP35A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3335

DATE	LEVEL	READING	CHANGE
7 8 1976	3292.85	42.15	00.00
7 19 1976	3292.36	42.64	00.49
8 27 1976	3291.78	43.22	00.58
9 14 1976	3291.64	43.36	00.14
10 29 1976	3291.64	43.36	00.00
11 17 1976	3291.71	43.29	-00.07
12 9 1976	3291.83	43.17	-00.12
1 25 1977	3292.12	42.88	-00.29
3 1 1977	3292.45	42.55	-00.33
3 24 1977	3292.48	42.52	-00.03
4 22 1977	3292.56	42.44	-00.08
5 31 1977	3292.34	42.66	00.22
6 23 1977	3292.02	42.98	00.32
7 29 1977	3291.81	43.19	00.21
10 4 1977	3291.25	43.75	00.56
10 27 1977	3283.11	51.89	08.14
12 13 1977	3292.44	42.56	-09.33
1 20 1978	3283.79	51.21	08.65
3 8 1978	3283.88	51.12	-00.09
4 21 1978	3284.52	50.48	-00.64
6 16 1978	3285.43	49.57	-00.91
7 5 1978	3285.22	49.78	00.21
8 17 1978	3284.59	50.41	00.63
10 19 1978	3283.96	51.04	00.63
12 6 1978	3294.38	40.62	-10.42
1 11 1979	3283.97	51.03	10.41
4 3 1979	3284.79	50.21	-00.82
5 21 1979	3284.95	50.05	-00.16
6 11 1979	3284.75	50.25	00.20
7 24 1979	3284.20	50.80	00.55
8 16 1979	3284.03	50.97	00.17
10 11 1979	3283.69	51.31	00.34

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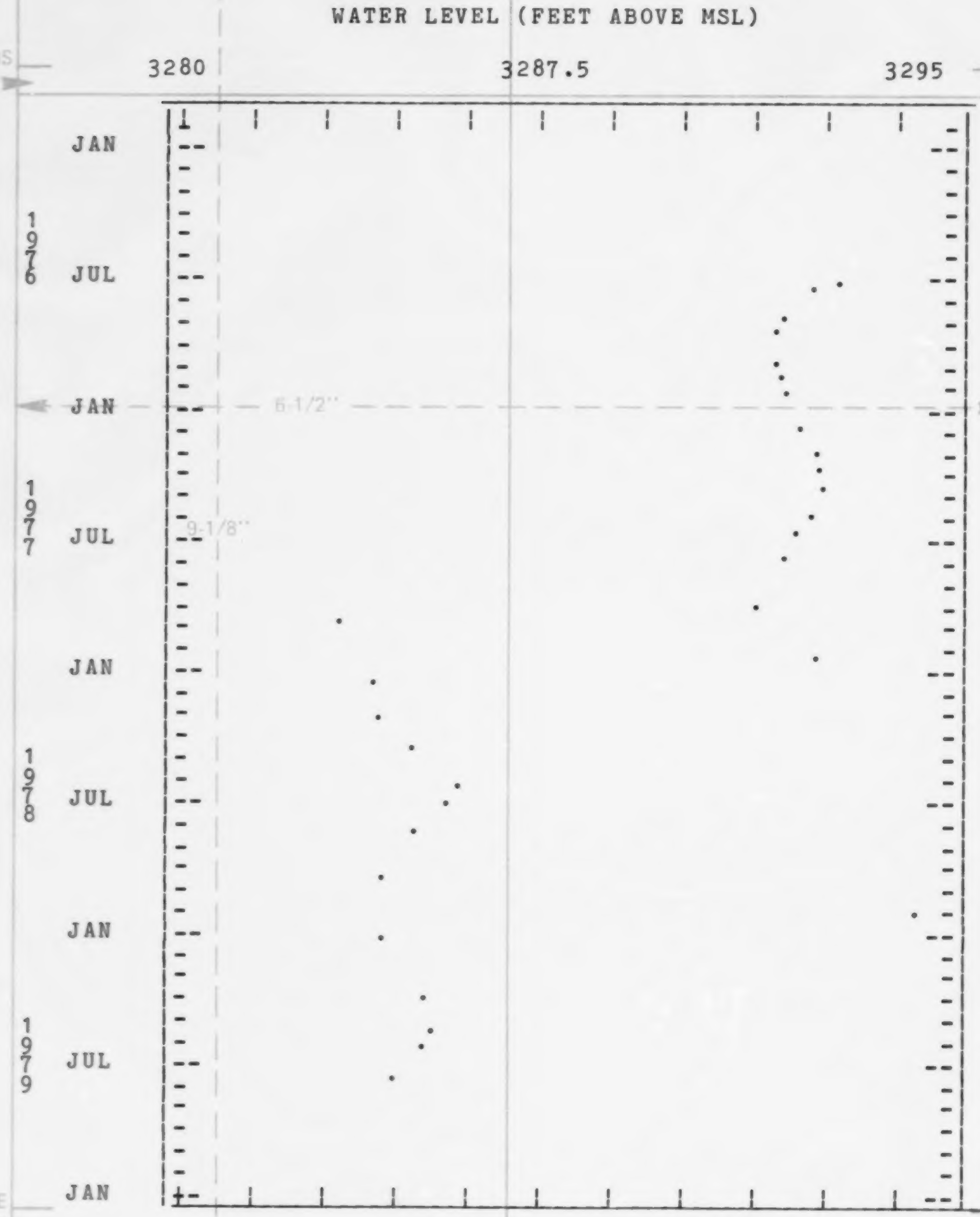
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP35A



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 35A (ROBINSON COAL AQUIFER) 1 of 2

DATE		070876	091476	120976	032477	062377
POTASSIUM	PPM	12.00	18.00	9.00	10.00	10.00
SODIUM	PPM	365	395	370	370	385
CALCIUM	PPM	235	241	352	234	229
MAGNESIUM	PPM	200	164	103	176	180
SULFATE	PPM	1830	1779	1778	1753	1773
CHLORIDE	PPM	14.00	13.00	16.00	8.00	14.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	390	439	378	390	305
FLOURIDE	PPM	0.20	0.30	0.20	0.18	0.20
SILICON DIO	PPM	19.00	24.00	29.00	31.00	32.00
TOTAL P	PPM	0.11	0.02	0.12	0.05	0.01
NITRATE	PPM	3.00	1.00	1.00	0.10	0.10
POTASSIUM	EPM	0.31	0.46	0.23	0.26	0.26
SODIUM	EPM	15.88	17.18	16.10	16.10	16.75
CALCIUM	EPM	11.73	12.03	17.56	11.68	11.43
MAGNESIUM	EPM	16.45	13.49	8.47	14.48	14.81
SULFATE	EPM	38.10	37.04	37.02	36.50	36.91
CHLORIDE	EPM	0.39	0.37	0.45	0.23	0.39
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	6.39	7.20	6.20	6.39	5.00
FLOURIDE	EPM	0.01	0.02	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		44.36	43.16	42.36	42.51	43.24
TOTAL ANIONS		44.80	44.52	43.56	43.07	42.21
DEVIATION		101	103	103	101	97.63
TDS (calc.)		2848	2826	2814	2743	2741
TDS @180		2938	3063	3041	2853	3003
TOTAL HARDNESS		1408	1274	1302	1305	1308
ALKALINITY		320	360	310	320	250
NON-CARB HARD		1088	914	992	985	1058
LAB CONDUCTIVITY		3000	3000	3300	3500	3347
FIELD COND.						
LAB pH		7.80	8.00	7.90	7.60	7.60
FIELD pH		6.50	6.70	7.70	7.20	

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

WELL NCRP 35A (ROBINSON COAL AQUIFER) 2 of 2

DATE		121377	MEAN	ST.DEV	#
POTASSIUM	PPM	8.00	11.17	3.29	6.00
SODIUM	PPM	380	377	10.31	6.00
CALCIUM	PPM	190	247	49.91	6.00
MAGNESIUM	PPM	159	164	30.11	6.00
SULFATE	PPM	1427	1723	135	6.00
CHLORIDE	PPM	10.00	12.50	2.69	6.00
CARBONATE	PPM	0.00	0.00	0.00	6.00
BICARBONATE	PPM	537	406	70.41	6.00
FLOURIDE	PPM	0.22	0.22	0.04	6.00
SILICON DIO	PPM	12.00	24.50	7.14	6.00
TOTAL P	PPM	0.01	0.05	0.05	6.00
NITRATE	PPM	1.10	0.68	1.25	6.00
POTASSIUM	EPM	0.20	0.29		
SODIUM	EPM	16.53	16.42		
CALCIUM	EPM	9.48	12.32		
MAGNESIUM	EPM	13.08	13.46		
SULFATE	EPM	29.71	35.88		
CHLORIDE	EPM	0.28	0.35		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	8.80	6.66		
FLOURIDE	EPM	0.01	0.01		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		39.29	42.49	1.57	6.00
TOTAL ANIONS		38.73	42.81	2.02	6.00
DEVIATION		98.57	101	2.04	6.00
TDS (calc.)		2438	2735	139	6.00
TDS @180		2461	2893	205	6.00
TOTAL HARDNESS		1126	1287	83.39	6.00
ALKALINITY		440	333	57.64	6.00
NON-CARB HARD		686	954	132	6.00
LAB CONDUCTIVITY		3038	3197	195	6.00
FIELD COND.		2080	2080	0.00	1.00
LAB pH		7.60	7.75	0.16	6.00
FIELD pH		7.40	7.10	0.44	5.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

WELL NCRP35B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3335

DATE	LEVEL	READING	CHANGE
7 8 1976	3292.38	42.62	00.00
7 19 1976	3292.03	42.97	00.35
8 27 1976	3290.57	44.43	01.46
9 14 1976	3291.28	43.72	-00.71
10 29 1976	3291.44	43.56	-00.16
11 17 1976	3291.49	43.51	-00.05
12 9 1976	3291.79	43.21	-00.30
1 25 1977	3292.18	42.82	-00.39
3 1 1977	3292.23	42.77	-00.05
3 24 1977	3292.26	42.74	-00.03
4 22 1977	3292.32	42.68	-00.06
5 31 1977	3292.24	42.76	00.08
6 23 1977	3291.89	43.11	00.35
7 29 1977	3291.32	43.68	00.57
10 4 1977	3290.75	44.25	00.57
10 27 1977	3291.16	43.84	-00.41
12 13 1977	3291.64	43.36	-00.48
1 20 1978	3291.50	43.50	00.14
3 8 1978	3291.63	43.37	-00.13
4 21 1978	3292.60	42.40	-00.97
6 13 1978	3292.95	42.05	-00.35
7 7 1978	3292.70	42.30	00.25
8 17 1978	3292.00	43.00	00.70
10 19 1978	3292.10	42.90	-00.10
12 6 1978	3293.93	41.07	-01.83
1 11 1979	3292.43	42.57	01.50
4 3 1977	3303.31	31.69	-10.88
5 21 1979	3293.23	41.77	10.08
6 11 1979	3293.02	41.98	00.21
7 24 1979	3292.32	42.68	00.70
8 16 1979	3292.11	42.89	00.21
10 11 1979	3293.82	41.18	-01.71

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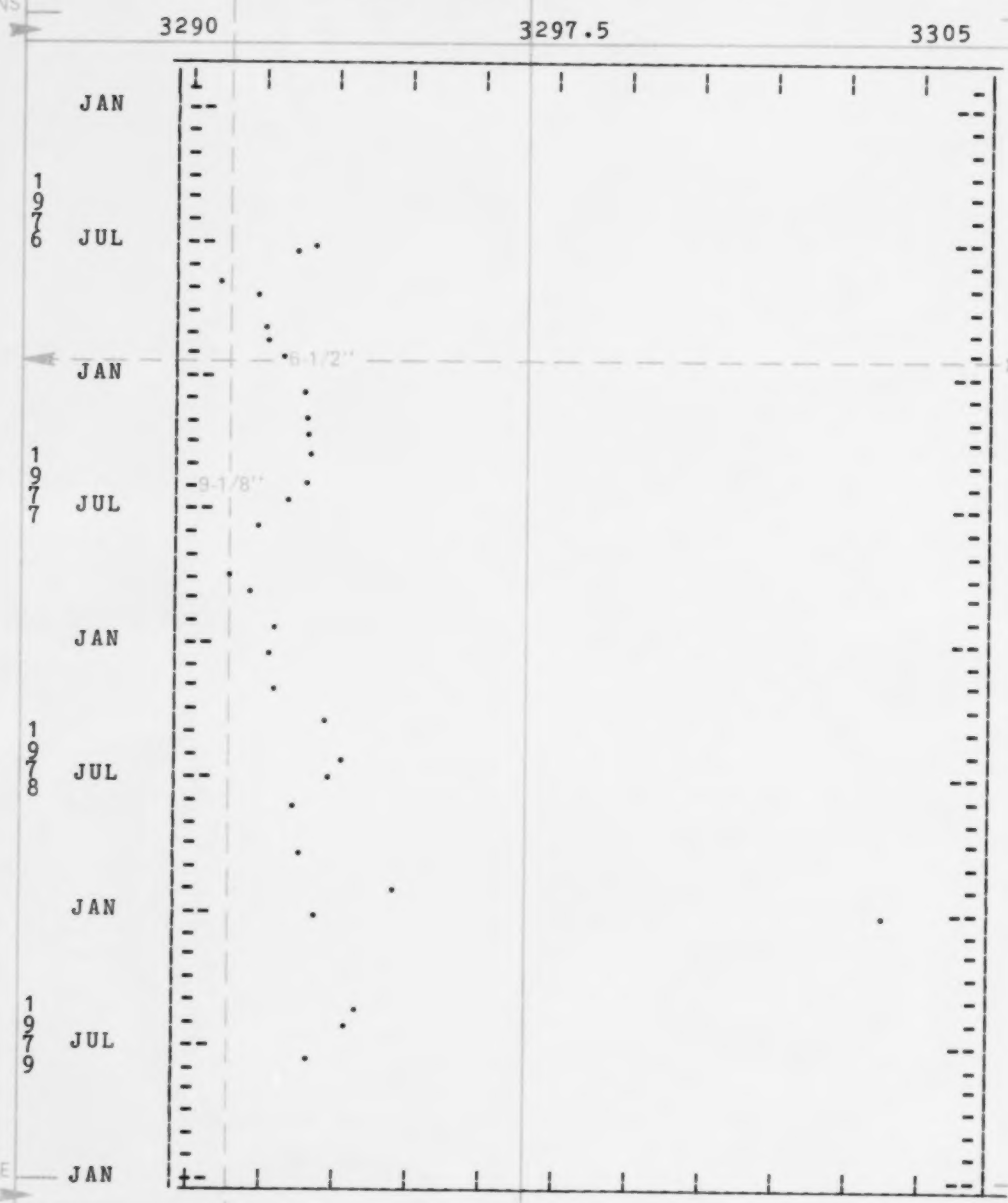
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP35B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 35B (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		070876	091476	120976	032477	062377
POTASSIUM	PPM	15.00	18.00	13.00	13.00	18.00
SODIUM	PPM	472	495	485	490	520
CALCIUM	PPM	231	378	524	273	209
MAGNESIUM	PPM	234	145	34.00	168	191
SULFATE	PPM	2036	2107	1964	1943	1926
CHLORIDE	PPM	12.00	12.00	17.00	1.00	13.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	641	631	610	610	628
FLOURIDE	PPM	0.20	0.30	0.20	0.20	0.23
SILICON DIO	PPM	6.00	8.00	12.00	14.00	16.00
TOTAL P	PPM	0.05	0.03	0.02	0.10	0.19
NITRATE	PPM	1.00	1.00	1.00	0.20	0.10
POTASSIUM	EPM	0.38	0.46	0.33	0.33	0.46
SODIUM	EPM	20.53	21.53	21.10	21.32	22.62
CALCIUM	EPM	11.53	18.86	26.15	13.62	10.43
MAGNESIUM	EPM	19.25	11.93	2.80	13.82	15.71
SULFATE	EPM	42.39	43.87	40.89	40.45	40.10
CHLORIDE	EPM	0.34	0.34	0.48	0.03	0.37
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	10.51	10.34	10.00	10.00	10.29
FLOURIDE	EPM	0.01	0.02	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		51.69	52.78	50.37	49.09	49.22
TOTAL ANIONS		53.16	54.48	51.25	50.48	50.68
DEVIATION		103	103	102	103	103
TDS (calc.)		3315	3466	3337	3188	3186
TDS @180		3481	3516	3426	3244	3369
TOTAL HARDNESS		1535	1537	1445	1373	1307
ALKALINITY		525	518	500	500	515
NON-CARB HARD		1010	1019	945	873	792
LAB CONDUCTIVITY		4000	3500	3800	4000	3977
FIELD COND.						
LAB pH		7.60	7.90	7.80	7.60	7.50
FIELD pH		6.40	6.80	6.80	7.10	

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
(4-76)

WELL NCRP 35B (UNCONSOLIDATED AQUIFER)   2 of 2

DATE		121377	MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	14.67	2.62	6.00
SODIUM	PPM	645	518	58.67	6.00
CALCIUM	PPM	175	298	119	6.00
MAGNESIUM	PPM	142	152	61.34	6.00
SULFATE	PPM	1840	1969	84.38	6.00
CHLORIDE	PPM	12.00	11.17	4.88	6.00
CARBONATE	PPM	0.00	0.00	0.00	6.00
BICARBONATE	PPM	573	615	22.03	6.00
FLOURIDE	PPM	0.20	0.22	0.04	6.00
SILICON DIO	PPM	11.00	11.17	3.39	6.00
TOTAL P	PPM	0.01	0.06	0.07	6.00
NITRATE	PPM	0.20	0.08	0.71	6.00
POTASSIUM	EPM	0.28	0.38		
SODIUM	EPM	28.06	22.53		
CALCIUM	EPM	8.73	14.89		
MAGNESIUM	EPM	11.68	12.53		
SULFATE	EPM	38.31	41.00		
CHLORIDE	EPM	0.34	0.32		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	9.39	10.09		
FLOURIDE	EPM	0.01	0.01		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		48.75	50.32	1.48	6.00
TOTAL ANIONS		47.96	51.33	2.07	6.00
DEVIATION		98.38	102	1.68	6.00
TDS (calc.)		3107	3266	119	6.00
TDS @180		3181	3369	121	6.00
TOTAL HARDNESS		1020	1369	177	6.00
ALKALINITY		470	505	17.99	6.00
NON-CARB HARD		550	865	161	6.00
LAB CONDUCTIVITY		3822	3850	176	6.00
FIELD COND.		2590	2590	0.00	1.00
LAB pH		7.70	7.68	0.13	6.00
FIELD pH		7.39	6.90	0.33	5.00

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TYPING GUIDE SHEET

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TOP OF IMAGE AREA

DROPPED HEAD; BEGIN SECTIONS HERE

LITHOLOGIC LOG

Well # NCRP #36A
Date Completed 7/7/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-8'	8'	Sand, Brown, Fine
8'-11'	3'	Sandstone, Gray, Soft
11'-12'	1'	Sandstone, Yellow, Soft
12'-14'	2'	Sandstone, Gray, Fine
14'-21'	7'	Siltstone, Brown
21'-30'	9'	Sandstone, Yellowish Gray Fine
30'-30.5'	.5'	Red Sandstone Streak
30.0'-42'	11.5'	Sandstone, Yellow, Gray, Fine
42'-42.5'	.5'	Coal
42.5'-54.5'	12'	Shale, Gray, Silty
54.5'-64'	9.5'	Coal, Dry
64'-66'	2'	Shale, Sandy, Gray
66'-68'	2'	Coal
68'-74.5'	6.5'	Shale, Sandy, Gray
74.5'-85'	10.5'	Coal, Dry
85'-92'	7'	Siltstone, Gray
92'-95'	3'	Shale, Gray, Silty
95'-101'	6'	Sandstone, Gray

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

#36A continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
101'-104'	3'	Coal
104'-109'	5'	Shale, Brownish Gray
109'-118	9'	Sandstone, Gray, Moist-H_2O 1-2 GPM
118'-119.5'	1.5'	Coal
119.5'-120.5'	1'	Shale, Gray
120.5'-122	1.5'	Sandstone

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP36A

GROUNDWATER LEVELS (FEET--DATUM MSL)

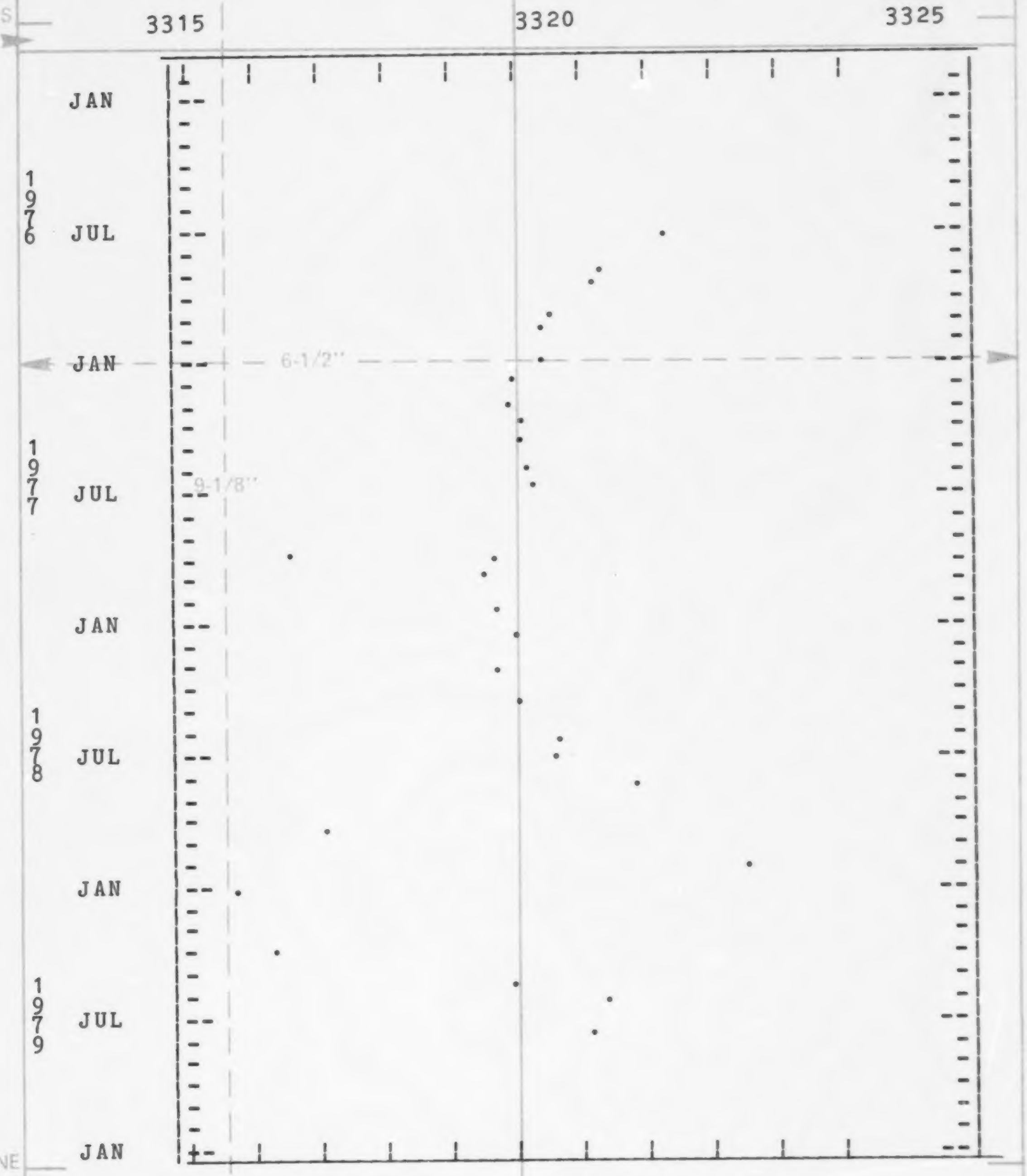
elevation at top of well casing is 3440

DATE	LEVEL	READING	CHANGE
7 8 1976	3321.79	118.21	00.00
8 27 1976	3320.88	119.12	00.91
9 14 1976	3320.77	119.23	00.11
10 29 1976	3320.18	119.82	00.59
11 17 1976	3320.02	119.98	00.16
12 29 1976	3320.03	119.97	-00.01
1 25 1977	3319.63	120.37	00.40
3 3 1977	3319.58	120.42	00.05
3 24 1977	3319.75	120.25	-00.17
4 22 1977	3319.74	120.26	00.01
5 31 1977	3319.82	120.18	-00.08
6 23 1977	3319.91	120.09	-00.09
9 29 1977	3316.47	123.53	03.44
10 4 1977	3319.35	120.65	-02.88
10 27 1977	3319.21	120.79	00.14
12 13 1977	3319.37	120.63	-00.16
1 20 1978	3319.67	120.33	-00.30
3 8 1978	3319.38	120.62	00.29
4 21 1978	3319.70	120.30	-00.32
6 13 1978	3320.24	119.76	-00.54
7 5 1978	3320.21	119.79	00.03
8 17 1978	3321.35	118.65	-01.14
10 19 1978	3316.96	123.04	04.39
12 6 1978	3322.94	117.06	-05.98
1 11 1979	3315.69	124.31	07.25
4 3 1979	3316.23	123.77	-00.54
5 21 1979	3319.61	120.39	-03.38
6 11 1979	3320.94	119.06	-01.33
7 27 1979	3320.71	119.29	00.23
8 16 1979	3320.53	119.47	00.18
10 11 1979	3320.06	119.94	00.47

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP36A

WATER LEVEL (FEET ABOVE MSL)



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3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 36B (ROSEBUD COAL AQUIFER) 1 of 2

DATE		070876	091476	122976	032477	032477
POTASSIUM	PPM	19.00	14.00	18.00	11.00	11.00
SODIUM	PPM	676	607	567	540	540
CALCIUM	PPM	169	253	264	296	296
MAGNESIUM	PPM	149	147	166	154	154
SULFATE	PPM	2051	2037	2021	2080	2080
CHLORIDE	PPM	5.00	18.00	14.00	11.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	488	598	561	561	561
FLOURIDE	PPM	0.20	0.30	0.30	0.20	0.20
SILICON DIO	PPM	28.00	20.00	29.00	9.00	9.00
TOTAL P	PPM	0.10	0.03	0.01	0.10	0.10
NITRATE	PPM	1.00	7.00	1.00	2.50	2.50
POTASSIUM	EPM	0.49	0.36	0.46	0.28	0.28
SODIUM	EPM	29.41	26.40	24.66	23.49	23.49
CALCIUM	EPM	8.43	12.62	13.17	14.77	14.77
MAGNESIUM	EPM	12.26	12.09	13.66	12.67	12.67
SULFATE	EPM	42.70	42.41	42.08	43.31	43.31
CHLORIDE	EPM	0.14	0.51	0.39	0.31	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.00	9.80	9.19	9.19	9.19
FLOURIDE	EPM	0.01	0.02	0.02	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		50.58	51.48	51.95	51.21	51.21
TOTAL ANIONS		50.82	52.60	51.58	52.74	52.74
DEVIATION		100	102	99.28	103	103
TDS (calc.)		3309	3370	3326	3368	3368
TDS @180		3359	3503	3475	3612	3612
TOTAL HARDNESS		1034	1236	1339	1374	1374
ALKALINITY		400	490	460	460	460
NON-CARB HARD		634	746	879	914	914
LAB CONDUCTIVITY		5000	3500	4200	4200	4200
FIELD COND.						
LAB pH		8.10	7.90	7.60	7.80	7.80
FIELD pH		6.50	6.60	8.10	7.00	7.00

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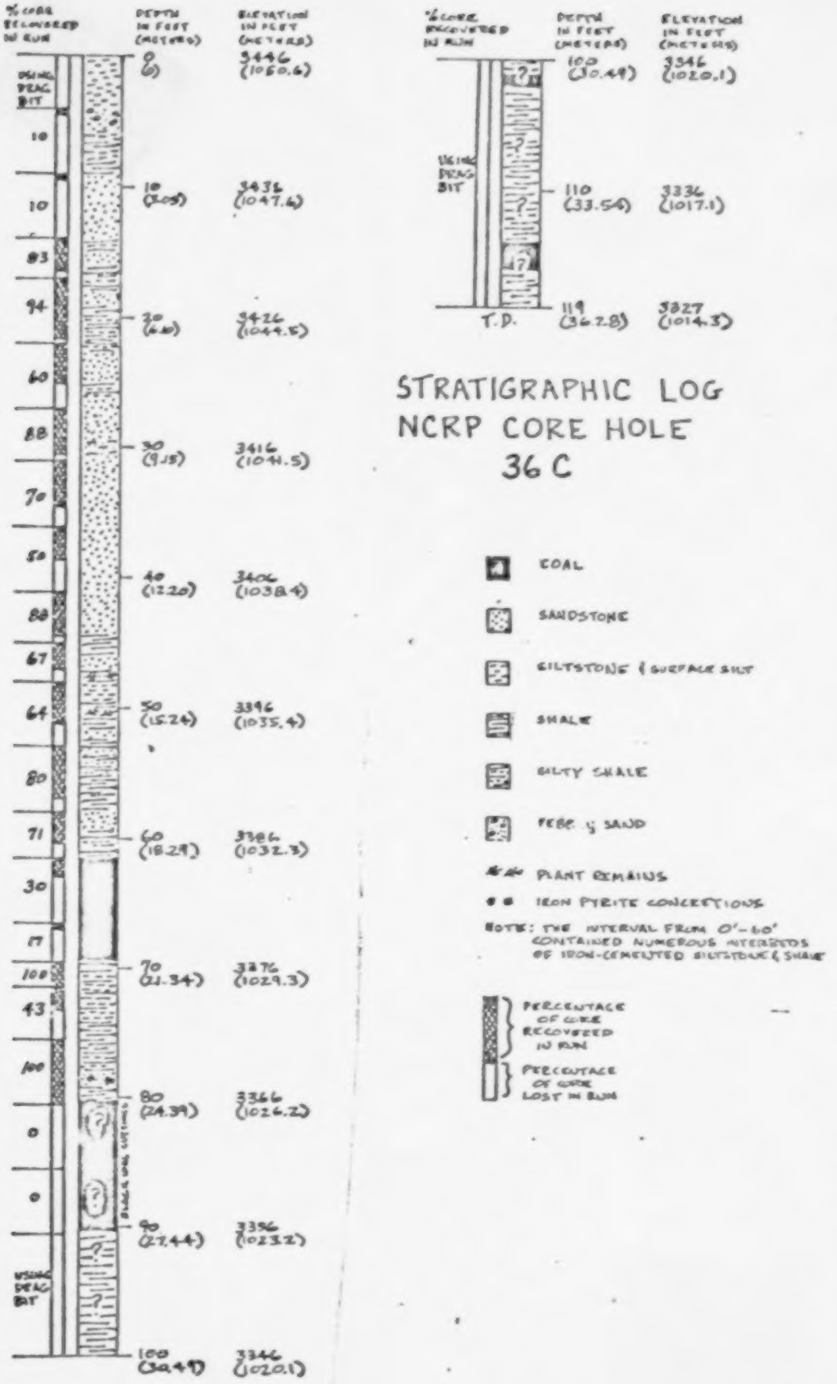
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 36B (ROSEBUD COAL AQUIFER) 2 of 2

DATE		062377	121377	MEAN	ST.DEV	#
POTASSIUM	PPM	13.00	12.00	14.00	3.02	7.00
SODIUM	PPM	580	605	588	43.93	7.00
CALCIUM	PPM	240	218	248	41.57	7.00
MAGNESIUM	PPM	163	184	160	11.84	7.00
SULFATE	PPM	2150	2094	2073	39.55	7.00
CHLORIDE	PPM	12.00	14.00	12.14	3.68	7.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	7.00
BICARBONATE	PPM	342	586	528	82.57	7.00
FLOURIDE	PPM	0.22	0.19	0.23	0.05	7.00
SILICON DIO	PPM	54.00	11.00	22.86	14.96	7.00
TOTAL P	PPM	0.01	0.02	0.05	0.05	7.00
NITRATE	PPM	4.50	1.10	2.51	2.41	7.00
POTASSIUM	EPM	0.33	0.31	0.36		
SODIUM	EPM	25.23	26.32	25.57		
CALCIUM	EPM	11.98	10.88	12.38		
MAGNESIUM	EPM	13.41	15.14	13.13		
SULFATE	EPM	44.76	43.60	43.17		
CHLORIDE	EPM	0.34	0.39	0.34		
CARBONATE	EPM	0.00	0.00	0.00		
BICARBONATE	EPM	5.61	9.60	8.66		
FLOURIDE	EPM	0.01	0.01	0.01		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		50.95	52.64	51.43	0.63	7.00
TOTAL ANIONS		50.63	53.50	52.09	1.01	7.00
DEVIATION		99.38	102	101	1.47	7.00
TDS (calc.)		3326	3415	3355	33.70	7.00
TDS @180		3443	3502	3501	83.55	7.00
TOTAL HARDNESS		1270	1299	1275	109	7.00
ALKALINITY		280	480	433	67.76	7.00
NON-CARB HARD		990	819	842	111	7.00
LAB CONDUCTIVITY		4055	4116	4182	406	7.00
FIELD COND.			2790	2790	0.00	1.00
LAB pH		7.50	8.00	7.81	0.20	7.00
FIELD pH			7.29	7.08	0.53	6.00

EPA-287 (Cin.)
(4-76)


% CORE RECOVERED IN RUN
DEPTH IN FEET (METERS)
ELEVATION IN FEET (METERS)
USING DRAG BIT
0 (0)
3446 (1050.6)
10
10
10 (3.05)
3436 (1047.6)
83
94
20 (6.10)
3426 (1044.5)
60
88
30 (9.15)
3416 (1041.5)
70
50
40 (12.20)
3406 (1038.4)
88
67
64
50 (15.24)
3396 (1035.4)
80
71
60 (18.29)
3386 (1032.3)
30
17
100
70 (21.34)
3376 (1029.3)
43
100
80 (24.39)
3366 (1026.2)
0
0
90 (27.44)
3356 (1023.2)
USING DRAG BIT
100 (30.49)
3346 (1020.1)
% CORE RECOVERED IN RUN
DEPTH IN FEET (METERS)
ELEVATION IN FEET (METERS)
100 (30.49)
3346 (1020.1)
USING DRAG BIT
110 (33.54)
3336 (1017.1)
T.D.
119 (36.28)
3327 (1014.5)
STRATIGRAPHIC LOG
NCRP CORE HOLE
36 C
COAL
SANDSTONE
SILTSTONE & SURFACE SILT
SHALE
SILTY SHALE
PEBB. & SAND
PLANT REMAINS
IRON PYRITE CONCRETIONS
NOTE: THE INTERVAL FROM 0'-60' CONTAINED NUMEROUS INTERBEDS OF IRON-CEMENTED SILTSTONE & SHALE
PERCENTAGE OF CORE RECOVERED IN RUN
PERCENTAGE OF CORE LOST IN RUN

Stratigraphic log for NCRP 36C

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP36C

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3442

DATE	LEVEL	READING	CHANGE
8 27 1976	3342.22	99.78	00.00
9 14 1976	3342.55	99.45	-00.33
10 29 1976	3340.09	101.91	02.46
11 17 1976	3339.93	102.07	00.16
12 29 1976	3339.88	102.12	00.05
1 25 1977	3340.01	101.99	-00.13
3 1 1977	3340.13	101.87	-00.12
3 24 1977	3339.93	102.07	00.20
4 22 1977	3339.78	102.22	00.15
5 31 1977	3340.02	101.98	-00.24
6 23 1977	3340.00	102.00	00.02
7 29 1977	3340.10	101.90	-00.10
10 4 1977	3339.96	102.04	00.14
10 27 1977	3340.20	101.80	-00.24
12 13 1977	3340.00	102.00	00.20
1 20 1978	3341.85	100.15	-01.85
3 8 1978	3339.87	102.13	01.98
4 21 1978	3340.96	101.04	-01.09
6 13 1978	3340.47	101.53	00.49
7 5 1978	3340.74	101.26	-00.27
10 19 1978	3337.30	104.70	03.44
12 6 1978	3345.38	96.62	-08.08
1 11 1979	3337.06	104.94	08.32
4 3 1979	3342.28	99.72	-05.22
5 21 1979	3342.66	99.34	-00.38
6 11 1979	3342.65	99.35	00.01
7 24 1979	3342.86	99.14	-00.21
8 16 1979	3342.92	99.08	-00.06
10 11 1979	3343.01	98.99	-00.09

TYPING GUIDE SHEET
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CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2
3-1/8"
BEGIN LAST LINE OF TEXT
3/8"
PAGE NUMBER
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
BEGIN FIRST LINE OF TEXT HERE
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD, BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG WELL: NCRP # 18

Completed: 4/1/76

Depth ft.	Thickness ft.	Description
0-3	3	Sandstone, Orane, Fine
3-7	4	Sandstone, Gray, Fine
7-9	2	Shale, Gray
9-10	1	Sandstone, Gray, Fine
10-11	1	Coal
11-21	10	Shale, Gray
21-22	1	Shale, Brown
22-31	9	Coal
31-35	4	Shale, Gray
35-36	1	Coal
36-39	3	Shale, Gray
39-39.5	.5	Sandstone, Hard Layer
39.5-45	5.5	Shale Gray
45-46	1	Shale, Brown
46-56	10	Coal
56-70	14	Shale, Gray
70-71	1	Coal
71-73	2	Shale, Gray
73-75	2	Shale, Sandstone, Gray, Fine

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
BEGIN FIRST LINE OF TEXT HERE
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"

#18 continued

Depth	Thickness	Description
75-85	10	Sandy Shale, Gray
85	0	Damp
85-88	3	Sandstone, Gray, Fine
88-89	1	
89	0	Shale, Gray, Balling
100	0	Water in hole
103-106	3	Shale, Brown
106-110	4	Shale, Gray
11.0	0	Shale, Brown
115-118	3	Shale, Brown
118-121	3	Shale, Brown
121-127	6	Coal
127-128	1	Shale, Gray

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP18

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3451

DATE	LEVEL	READING	CHANGE
6 9 1976	3363.95	87.05	00.00
6 29 1976	3363.65	87.35	00.30
7 8 1976	3392.81	58.19	-29.16
7 19 1976	3363.42	87.58	29.39
8 27 1976	3363.01	87.99	00.41
9 14 1976	3362.80	88.20	00.21
10 29 1976	3362.56	88.44	00.24
11 16 1976	3362.45	88.55	00.11
12 29 1976	3362.76	88.24	-00.31
1 25 1977	3362.94	88.06	-00.18
3 1 1977	3363.00	88.00	-00.06
3 23 1977	3363.37	87.63	-00.37
4 22 1977	3363.32	87.68	00.05
5 31 1977	3363.10	87.90	00.22
6 23 1977	3362.85	88.15	00.25
7 29 1977	3362.70	88.30	00.15
10 4 1977	3362.14	88.86	00.56
10 27 1977	3362.01	88.99	00.13
12 15 1977	3362.26	88.74	-00.25
1 19 1978	3362.45	88.55	-00.19
3 8 1978	3363.08	87.92	-00.63
4 21 1978	3363.75	87.25	-00.67
6 6 1978	3363.98	87.02	-00.23
7 7 1978	3363.58	87.42	00.40
8 17 1978	3363.06	87.94	00.52
12 6 1978	3367.87	83.13	-04.81
1 11 1979	3363.26	87.74	04.61
4 3 1979	3364.28	86.72	-01.02
5 21 1979	3364.22	86.78	00.06
6 11 1979	3363.97	87.03	00.25
7 24 1979	3363.22	87.78	00.75
8 16 1979	3363.00	88.00	00.22
10 11 1979	3362.92	88.08	00.08

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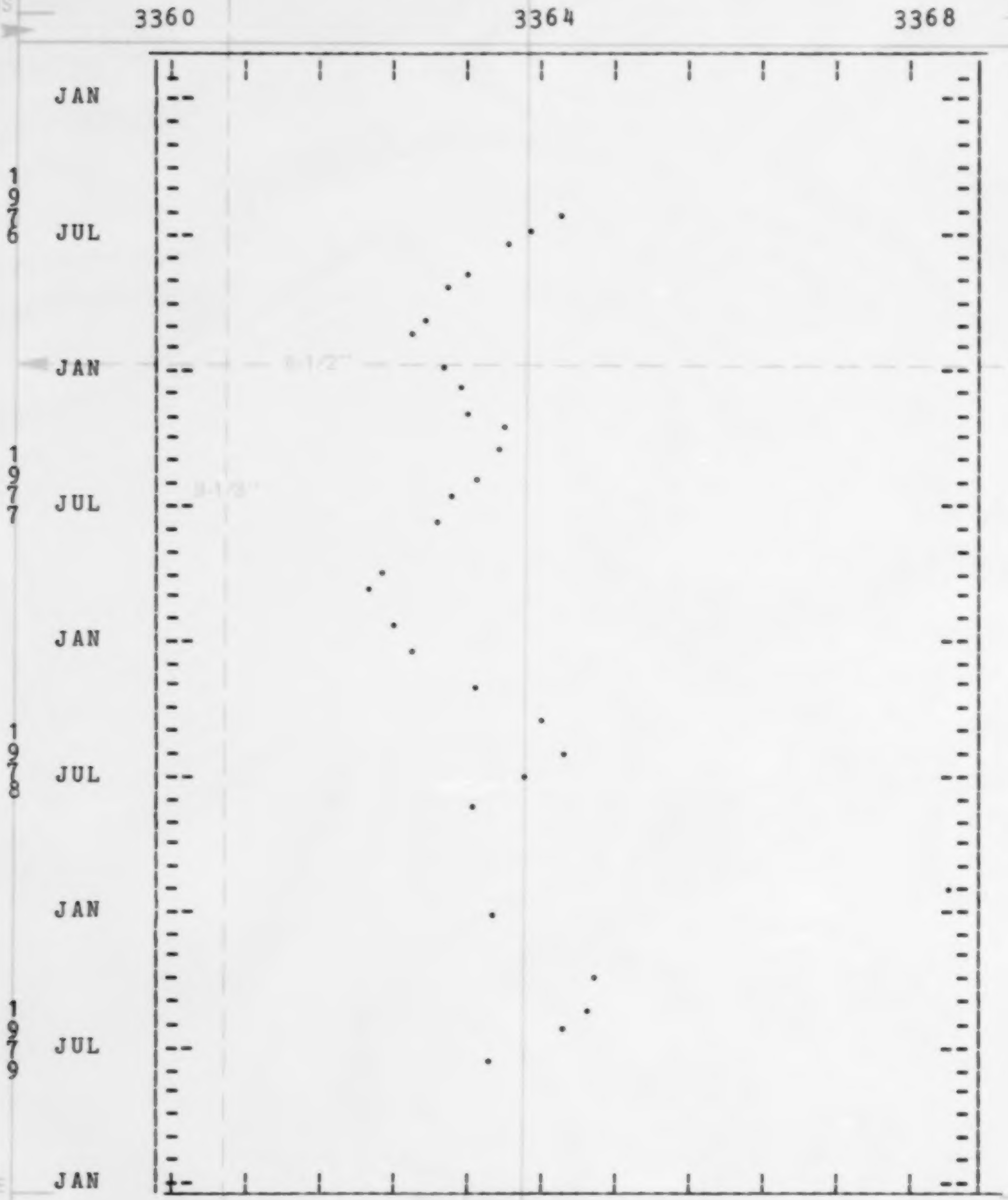
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP18



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 18 (ROSEBUD COAL AQUIFER) 1 of 2

DATE		062976	070876	091476	122976	032377
POTASSIUM	PPM	15.00	28.00	14.00	27.00	23.00
SODIUM	PPM	901	838	880	766	790
CALCIUM	PPM	10.00	14.00		4.00	5.00
MAGNESIUM	PPM	15.00	11.00		13.00	13.00
SULFATE	PPM	1451	1445	1387	1372	1335
CHLORIDE	PPM	12.00	11.00	16.00	14.00	12.00
CARBONATE	PPM	188	204	258	168	180
BICARBONATE	PPM	39.00	20.00	3.00	0.00	170
FLOURIDE	PPM	0.30	0.40	0.40	0.40	0.40
SILICON DIO	PPM	3.00	1.00	2.00	2.00	4.00
TOTAL P	PPM	0.02	0.04	0.01	0.01	0.03
NITRATE	PPM	3.00	1.00	1.00	3.00	0.10
POTASSIUM	EPM	0.38	0.72	0.36	0.69	0.59
SODIUM	EPM	39.19	36.45	38.28	33.32	34.37
CALCIUM	EPM	0.50	0.70		0.20	0.25
MAGNESIUM	EPM	1.23	0.90		1.07	1.07
SULFATE	EPM	30.21	30.08	28.88	28.57	27.79
CHLORIDE	EPM	0.34	0.31	0.45	0.39	0.34
CARBONATE	EPM	6.27	6.80	8.60	5.60	6.00
BICARBONATE	EPM	0.64	0.33	0.05	0.00	2.79
FLOURIDE	EPM	0.02	0.02	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		41.31	38.77	171	35.28	36.27
TOTAL ANIONS		37.38	37.46	37.88	34.48	36.85
DEVIATION		90.49	96.62	22.20	97.72	102
TDS (calc.)		2629	2551	2555	2364	2391
TDS @180		2507	2470	2475	2315	2399
TOTAL HARDNESS		88.00	79.00	25.00	64.00	66.00
ALKALINITY		425	400	435	370	350
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		5000	3000	3500	3700	3700
FIELD COND.						
LAB pH						
FIELD pH			9.20	9.60		

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 18 (ROSEBUD COAL AQUIFER) 2 of 2

DATE		062377	MEAN	ST.DEV	#
POTASSIUM	PPM	18.00	20.83	5.52	6.00
SODIUM	PPM	780	826	51.15	6.00
CALCIUM	PPM	6.00	7.80	3.71	5.00
MAGNESIUM	PPM	13.00	13.00	1.26	5.00
SULFATE	PPM	1373	1394	41.45	6.00
CHLORIDE	PPM	14.00	13.17	1.67	6.00
CARBONATE	PPM	180	196	29.63	6.00
BICARBONATE	PPM	37.00	44.83	57.94	6.00
FLOURIDE	PPM	0.37	0.38	0.04	6.00
SILICON DIO	PPM	6.00	3.00	1.63	6.00
TOTAL P	PPM	0.08	0.03	0.03	6.00
NITRATE	PPM	0.20	0.68	1.70	6.00
POTASSIUM	EPM	0.46	0.53		
SODIUM	EPM	33.93	35.92		
CALCIUM	EPM	0.30	0.39		
MAGNESIUM	EPM	1.07	1.07		
SULFATE	EPM	28.59	29.02		
CHLORIDE	EPM	0.39	0.37		
CARBONATE	EPM	6.00	6.54		
BICARBONATE	EPM	0.61	0.73		
FLOURIDE	EPM	0.02	0.02		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		35.76	59.68	49.68	6.00
TOTAL ANIONS		35.50	36.59	1.21	6.00
DEVIATION		99.29	84.65	28.14	6.00
TDS (calc.)		2402	2482	100	6.00
TDS @180		2392	2426	64.68	6.00
TOTAL HARDNESS		68.00	65.00	19.73	6.00
ALKALINITY		330	385	38.30	6.00
NON-CARB HARD		0.00	0.00	0.00	6.00
LAB CONDUCTIVITY		3395	3716	621	6.00
FIELD COND.			0.00	0.00	0.00
LAB pH		9.70	9.70	0.00	1.00
FIELD pH			9.40	0.20	2.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG WELL: NCRP #17

Completed: 10-22-75

Depth	Thickness	Description
0-5	5	Soil, Brown
5-7	2	Silty Clay, Orange, Yellow, Moist
7-10	3	Silty Clay, Tan or White
10-11	1	Clay, Red
11-17	6	Shale, Gray-Orange, Soft
17-23	6	Sandy Silt, Red
23-25	2	Clay, Red
25-27	2	Sand, Reddish Brown, Soft
27-30	3	Clayey Sand, Red Varied Color
30-31	1	Sandstone, White, Fine
31-38	7	Clayey Sandstone, Red, Fine
38-43	5	Sandy Shale, Red
43-50	7	Shale, Brownish Orange
50-55	5	Shale, Brown, SS Stringer, Pink, Fine
55-58	3	Shale
58-63	5	Shale, Gray
63-68	5	Coal, Black, Clay Stringer
68-73	5	Shale, Gray Hard

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3/8''

#17 continued

Depth	Thickness	Description
ft.	ft.	
73-74	1	Coal
74-76	2	Shale, Gray
76-95	19	Sandstone, Blue-Gray, Fine, (H_2O) (90)
95-98	3	Sandy Shale, Gray, Dry
98-104	6	Coal, Brown, 100 ft. Black Coal
104-107	3	Shale, Gray
107-110	3	Sandstone, Gray, Fine
110-112	2	Shale, Gray
112-128	16	NR
128-140	12	Shale, Blue Gray
140-145	5	Clayey Sandstone, Gray
145-149	3	Sandstone, Gray, Fine
149-150	1	Clayey Sandstone
150-155	5	Shale, Gray, Organic
155-156	1	Sandy, Shale, Brown, Gray
156-164	8	Sandstone, Gray, Fine
164-165	1	Sandy Shale, Gray
165-170	5	Sandstone, Fine, Brown, Organic
120-123	3	Sandstone, Brown, Fine
123-184	11	Sandstone, Gray, Fine

EPA-287 (Cin.)
(4-76)

#17 continued

Depth	Thickness	Description
ft.	ft.	
184-186	2	Coal, Mixed SS, Clay, Brown
186-198	12	Sandstone, Brown, Fine
198-220	22	No return, switched to water
220-245	25	Sandy Shale, Blue Gray
245-280	35	Shale, Gray

EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP17B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3975

DATE	LEVEL	READING	CHANGE
6 9 1976	3893.00	82.00	00.00
7 19 1976	3892.41	82.59	00.59
8 27 1976	3892.25	82.75	00.16
9 14 1976	3891.75	83.25	00.50
10 29 1976	3892.15	82.85	-00.40
11 10 1976	3892.07	82.93	00.08
12 29 1976	3892.16	82.84	-00.09
3 23 1977	3892.35	82.65	-00.19
4 22 1977	3892.26	82.74	00.09
5 31 1977	3892.66	82.34	-00.40
6 26 1977	3892.57	82.43	00.09
7 29 1977	3892.42	82.58	00.15
10 27 1977	3892.73	82.27	-00.31
12 13 1977	3892.28	82.72	00.45
1 19 1978	3901.86	73.14	-09.58
2 28 1978	3887.17	87.83	14.69
4 21 1978	3891.12	83.88	-03.95
6 6 1978	3892.96	82.04	-01.84
7 7 1978	3893.15	81.85	-00.19
8 17 1978	3895.17	79.83	-02.02
5 21 1979	3893.55	81.45	01.62
6 11 1979	3893.59	81.41	-00.04
7 24 1979	3893.50	81.50	00.09
8 16 1979	3893.53	81.47	-00.03
10 11 1979	3893.56	81.44	-00.03

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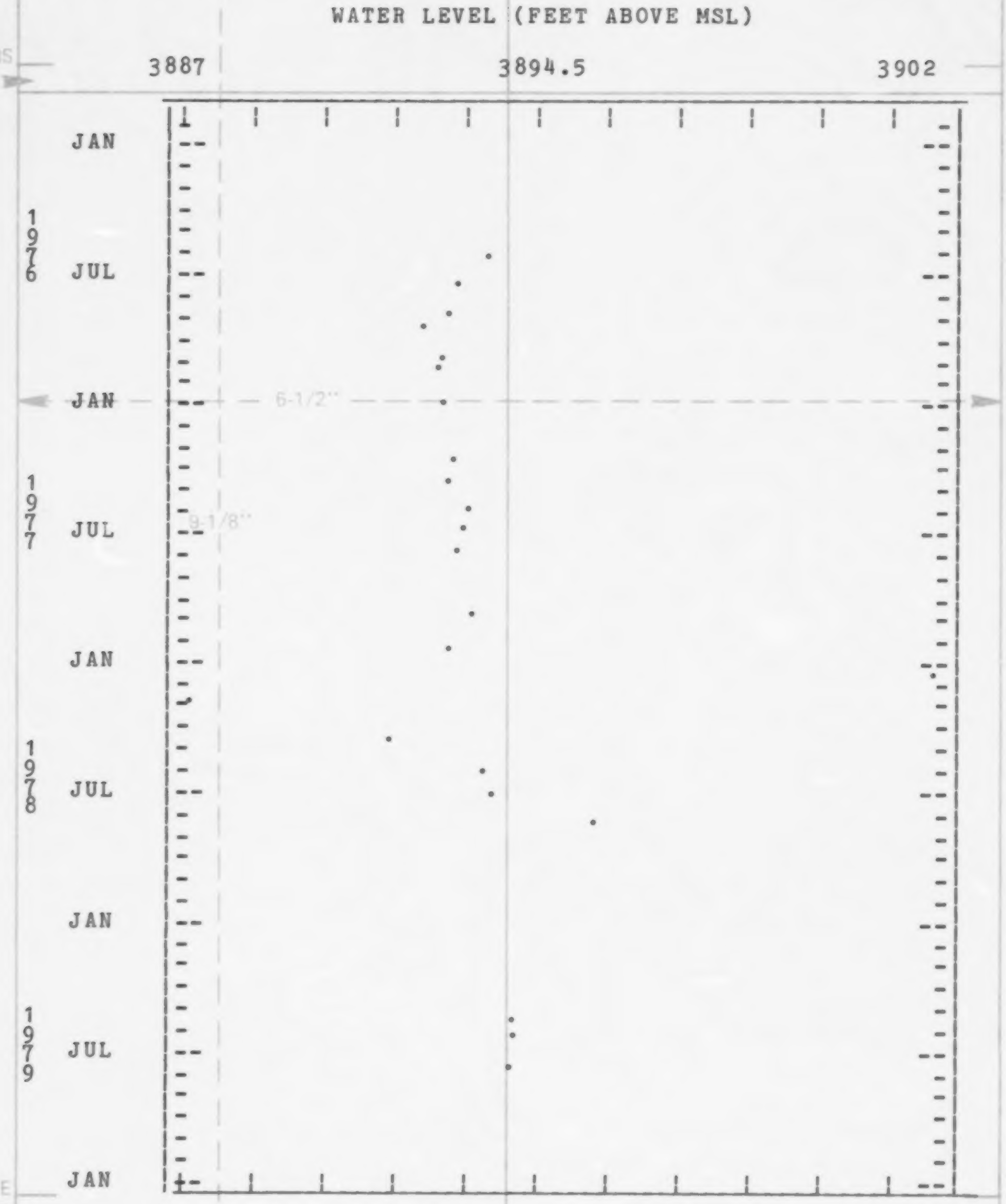
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP17B



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EPA-287 (Cin.)
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LITHOLOGIC LOG

Well # NCRP #40 AB
Date Completed 7/6/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-11'	11'	Sand, Greenish-Grey, Medium Fine, Sandstone 7'
11'-15'.5	4.5'	Sandstone, Rusty Orange, Medium Fine, Soft
15.5'-17'	1.5'	Sandstone, Greenish-Grey, Medium Fine
17'-18'	1'	Sandstone, Rusty Orange, Medium Fine
18'-25.5	7.5'	Sandstone, Greenish-Grey, Medium Fine, Damp at 25'
25.5'-31'	5.5	Coal - Water in Hole at 40' Pipe Change
31'-35'	4'	Shale, Silty, Grey
35'-37'	2'	Sandstone, Silty, Grey
37'-38'	1'	Coal
38'-42.5'	4.5'	Shale, Dark Grey
42.5'-45'	2.5'	Coal
45'-45.5'	.5'	Sandstone, Hard, Brown
45.5'-48'	2.5'	Shale, Sandy, Grey
48'-55.5'	7.5'	Sandstone, Fine, Grey, Soft Clayey

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3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#40 continued

DEPTH	THICKNESS	DESCRIPTION
55.5'-57.5'	2'	Sandstone, Hard, Grey, Limy, Cement?
57.5'-69.5'	12'	Siltstone, Grey, Shalier, toward base
69.5'-70'	.5'	Sandstone, Very Fine, Hard
70'-74'	4'	Sandstone, Fine, Wet, Grey
74'-76'	2'	Sandstone, Grey, Clayey, Soft
76'-79'	3'	Shale, Light Grey
79'-80'	1'	Coal
80'-87'	7'	Shale, Grey
87'-96.5'	9.5	Coal, Dry
96.5'-106.5'	10'	Sandstone, Fine, Dry, Light Grey, Clayey
106.5'-108'	1.5'	Coal, Dirty
108'-112'	4'	Shale, Sandy, Grey to Dark Brown
112'-117'	5'	Sandstone, Harder
117'-118'	1'	Sandstone, Soft
118'-125'	7'	Shale, Hard, Sandy
125'-128'	3'	Sandstone,Fine, Grey, Hard, Wet
128'-130'	2'	Shale
130'-136'	6'	Sandstone, Grey, Fine
136'-137.5'	1.5	Coal

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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#40 Continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
137.5'-153'	15.5	Sandstone, Grey, Fine
153'-156'	3'	Coal, Dirty
156'-159.5'	3.5'	Cleaner Coal
159.5'-160'	.5	Shale

WELL NCRP40A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3560

DATE	LEVEL	READING	CHANGE
7 19 1976	3513.49	46.51	00.00
8 27 1976	3513.12	46.88	00.37
9 14 1976	3512.93	47.07	00.19
10 29 1976	3509.42	50.58	03.51
11 16 1976	3509.41	50.59	00.01
12 14 1976	3508.09	51.91	01.32
3 1 1977	3506.69	53.31	01.40
3 24 1977	3506.47	53.53	00.22
4 22 1977	3511.66	48.34	-05.19
5 31 1977	3512.13	47.87	-00.47
6 23 1977	3512.16	47.84	-00.03
7 29 1977	3512.10	47.90	00.06
10 13 1977	3511.72	48.28	00.38
10 27 1977	3511.83	48.17	-00.11
12 13 1977	3511.33	48.67	00.50
1 19 1978	3509.46	50.54	01.87
2 28 1978	3510.79	49.21	-01.33
4 21 1978	3512.65	47.35	-01.86
6 6 1978	3513.60	46.40	-00.95
7 5 1978	3513.79	46.21	-00.19
4 3 1979	3514.49	45.51	-00.70
5 21 1979	3515.73	44.27	-01.24
6 11 1979	3515.80	44.20	-00.07
7 24 1979	3515.44	44.56	00.36
8 17 1979	3513.70	46.30	01.74
8 16 1979	3515.42	44.58	-01.72

EPA-287 (Cin.)
(4-76)

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HYDROGRAPH FOR WELL NCRP40A

WATER LEVEL (FEET ABOVE MSL)

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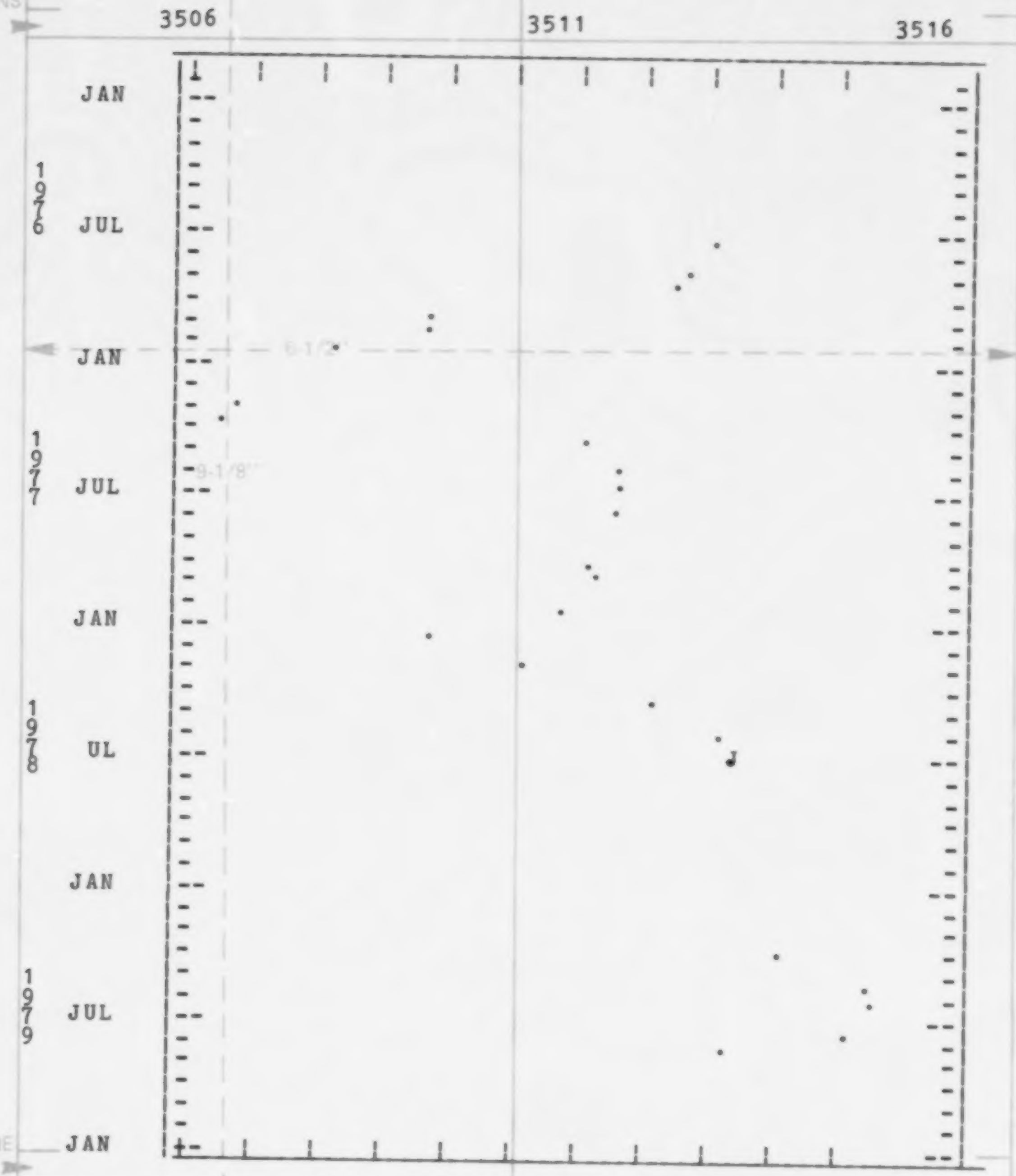

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DIMENSION
FOR TABLES
AND ILLUS-
TRATIONS

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL NCRP 40A (ROSEBUD COAL AQUIFER) 1 of 2

DATE		070876	091476	121476	032477	062377
POTASSIUM	PPM	15.00	8.00	6.00	5.00	7.00
SODIUM	PPM	151	68.00	55.00	60.00	75.00
CALCIUM	PPM	254	206	276	158	167
MAGNESIUM	PPM	143	69.00	38.00	101	97.00
SULFATE	PPM	1221	573	585	592	583
CHLORIDE	PPM	12.00	13.00	13.00	7.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	415	439	439	427	427
FLOURIDE	PPM	0.30	0.60	0.20	0.20	0.18
SILICON DIO	PPM	11.00	9.00	12.00	15.00	14.00
TOTAL P	PPM	0.05	0.06	0.05	0.10	0.01
NITRATE	PPM	2.00	1.00	1.00	0.10	0.10
POTASSIUM	EPM	0.38	0.20	0.15	0.13	0.18
SODIUM	EPM	6.57	2.96	2.39	2.61	3.26
CALCIUM	EPM	12.67	10.28	13.77	7.88	8.33
MAGNESIUM	EPM	11.76	5.68	3.13	8.31	7.98
SULFATE	EPM	25.42	11.93	12.18	12.33	12.14
CHLORIDE	EPM	0.34	0.37	0.37	0.20	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	6.80	7.20	7.20	7.00	7.00
FLOURIDE	EPM	0.02	0.03	0.01	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		31.39	19.12	19.44	18.93	19.75
TOTAL ANIONS		32.49	19.43	19.66	19.48	19.35
DEVIATION		104	102	101	103	97.98
TDS (calc.)		2000	1153	1189	1133	1149
TDS @180		2051	1491	1172	1173	1196
TOTAL HARDNESS		1222	798	846	807	816
ALKALINITY		340	360	360	350	350
NON-CARB HARD		882	438	486	457	466
LAB CONDUCTIVITY		2500	1180	1440	1600	1668
FIELD COND.						
LAB pH		7.70	7.50	7.40	7.50	7.20
FIELD pH		6.20	6.20	6.80	6.90	

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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 40A (ROSEBUD COAL AQUIFER) 2 of 2

DATE		101377	121377	MEAN	ST.DEV	#
POTASSIUM	PPM	10.00	7.00	8.29	3.10	7.00
SODIUM	PPM	80.00	70.00	79.86	30.08	7.00
CALCIUM	PPM	144	132	191	51.79	7.00
MAGNESIUM	PPM	149	131	104	37.63	7.00
SULFATE	PPM	717	630	700	218	7.00
CHLORIDE	PPM	12.00	9.00	10.86	2.10	7.00
CARBONATE	PPM	24.00	0.00	3.43	8.40	7.00
BICARBONATE	PPM	403	439	427	12.83	7.00
FLOURIDE	PPM	0.18	0.22	0.27	0.14	7.00
SILICON DIO	PPM	10.00	14.00	12.14	2.10	7.00
TOTAL P	PPM	0.01	0.02	0.04	0.04	7.00
NITRATE	PPM	1.20	0.40	0.23	1.02	7.00
POTASSIUM	EPM	0.26	0.18	0.21		
SODIUM	EPM	3.48	3.05	3.47		
CALCIUM	EPM	7.19	6.59	9.53		
MAGNESIUM	EPM	12.26	10.78	8.56		
SULFATE	EPM	14.93	13.12	14.58		
CHLORIDE	EPM	0.34	0.25	0.31		
CARBONATE	EPM	0.80	0.00	0.11		
BICARBONATE	EPM	6.61	7.20	7.00		
FLOURIDE	EPM	0.01	0.01	0.01		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		23.18	20.59	21.77	4.15	7.00
TOTAL ANIONS		22.59	20.51	21.93	4.44	7.00
DEVIATION		97.47	99.63	101	2.16	7.00
TDS (calc.)		1334	1195	1308	289	7.00
TDS @180		1338	1285	1387	291	7.00
TOTAL HARDNESS		972	866	904	141	7.00
ALKALINITY		370	360	356	9.03	7.00
NON-CARB HARD		602	506	548	145	7.00
LAB CONDUCTIVITY		1617	1490	1642	381	7.00
FIELD COND.		1390	1030	1210	180	2.00
LAB pH		8.30	7.80	7.63	0.33	7.00
FIELD pH			7.29	6.68	0.42	5.00

EPA-287 (Cin.)
(4-76)

WELL NCRP40B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3560

DATE	LEVEL	READING	CHANGE
7 19 1976	3529.99	30.01	00.00
8 27 1976	3529.90	30.10	00.09
9 14 1976	3529.96	30.04	-00.06
10 29 1976	3529.99	30.01	-00.03
11 16 1976	3529.95	30.05	00.04
3 1 1977	3529.93	30.07	00.02
3 24 1977	3529.81	30.19	00.12
4 22 1977	3529.65	30.35	00.16
5 31 1977	3529.70	30.30	-00.05
6 23 1977	3529.74	30.26	-00.04
7 29 1977	3529.74	30.26	00.00
10 13 1977	3530.10	29.90	-00.36
10 27 1977	3529.66	30.34	00.44
12 13 1977	3529.61	30.39	00.05
1 19 1978	3529.05	30.95	00.56
2 28 1978	3529.56	30.44	-00.51
4 21 1978	3529.79	30.21	-00.23
6 6 1978	3530.00	30.00	-00.21
7 5 1978	3530.08	29.92	-00.08
8 17 1978	3530.12	29.88	-00.04
4 3 1979	3529.40	30.60	00.72
5 21 1979	3530.21	29.79	-00.81
6 11 1979	3530.16	29.84	00.05
7 24 1979	3529.69	30.31	00.47
8 16 1979	3529.15	30.85	00.54

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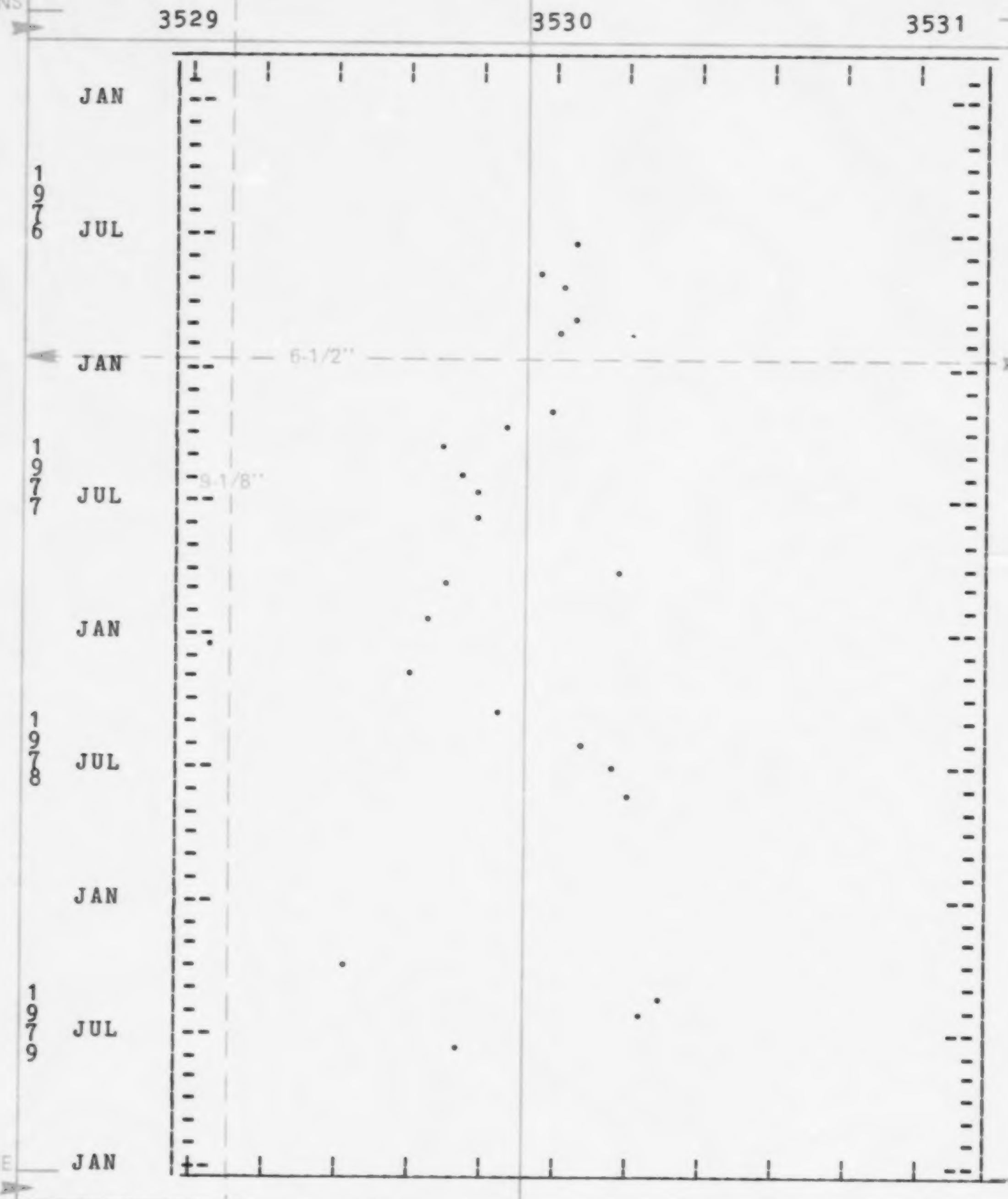
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP40B

WATER LEVEL (FEET ABOVE MSL)



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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 40B (COAL AQUIFER) 1 of 2

DATE		070876	091476	121476	032477	062377
POTASSIUM	PPM	50.00	23.00	12.00	36.00	33.00
SODIUM	PPM	50.00	31.00	50.00	55.00	50.00
CALCIUM	PPM	803	620	400	254	268
MAGNESIUM	PPM	9.00		1.00	1.00	5.00
SULFATE	PPM	1121	16.00	32.00	124	216
CHLORIDE	PPM	24.00	10.00	4.00	24.00	13.00
CARBONATE	PPM	36.00	72.00	24.00	60.00	36.00
BICARBONATE	PPM	344	551	361	194	194
FLOURIDE	PPM	0.20	0.30	0.30	0.20	0.22
SILICON DIO	PPM	1.00	1.00	13.00	3.00	3.00
TOTAL P	PPM	0.09	0.02	0.03	0.20	0.27
NITRATE	PPM	3.00	6.00	5.00	0.40	2.00
POTASSIUM	EPM	1.28	0.59	0.31	0.92	0.84
SODIUM	EPM	2.18	1.35	2.18	2.39	2.18
CALCIUM	EPM	40.07	30.94	19.96	12.67	13.37
MAGNESIUM	EPM	0.74		0.08	0.08	0.41
SULFATE	EPM	23.34	0.33	0.67	2.58	4.50
CHLORIDE	EPM	0.68	0.28	0.11	0.68	0.37
CARBONATE	EPM	1.20	2.40	0.80	2.00	1.20
BICARBONATE	EPM	5.64	9.03	5.92	3.18	3.18
FLOURIDE	EPM	0.01	0.02	0.02	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		44.26	115	22.36	15.91	16.80
TOTAL ANIONS		30.69	11.99	7.48	8.27	9.16
DEVIATION		69.33	10.42	33.46	52.02	54.53
TDS (calc.)		2437	1323	883	747	875
TDS @180		2650	1409	933	858	973
TOTAL HARDNESS		2038	1546	998	632	688
ALKALINITY		1070	1560	1100	670	630
NON-CARB HARD		968	0.00	0.00	0.00	58.00
LAB CONDUCTIVITY		600		4400	2600	3250
FIELD COND.						
LAB pH						
FIELD pH						

EPA-287 (Cin.)
(4-76)

WELL NCRP 40B (COAL AQUIFER) 2 of 2

DATE		121377	MEAN	ST.DEV	#
POTASSIUM	PPM	31.00	30.83	11.65	6.00
SODIUM	PPM	50.00	47.67	7.67	6.00
CALCIUM	PPM	214	426	216	6.00
MAGNESIUM	PPM	5.00	3.40	3.88	5.00
SULFATE	PPM	163	279	383	6.00
CHLORIDE	PPM	6.00	13.50	7.95	6.00
CARBONATE	PPM	36.00	44.00	16.49	6.00
BICARBONATE	PPM	153	299	137	6.00
FLOURIDE	PPM	0.22	0.24	0.04	6.00
SILICON DIO	PPM	4.00	4.17	4.10	6.00
TOTAL P	PPM	0.01	0.10	0.10	6.00
NITRATE	PPM	0.20	2.77	2.17	6.00
POTASSIUM	EPM	0.79	0.79		
SODIUM	EPM	2.18	2.07		
CALCIUM	EPM	10.68	21.28		
MAGNESIUM	EPM	0.41	0.28		
SULFATE	EPM	3.39	5.80		
CHLORIDE	EPM	0.17	0.38		
CARBONATE	EPM	1.20	1.47		
BICARBONATE	EPM	2.51	4.91		
FLOURIDE	EPM	0.01	0.01		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		14.06	38.07	35.90	6.00
TOTAL ANIONS		7.24	12.47	8.30	6.00
DEVIATION		51.49	45.21	18.72	6.00
TDS (calc.)		505	1128	634	6.00
TDS @180		843	1278	643	6.00
TOTAL HARDNESS		552	1076	544	6.00
ALKALINITY		550	930	353	6.00
NON-CARB HARD		2.00	171	357	6.00
LAB CONDUCTIVITY		2646	2699	1234	5.00
FIELD COND.		1820	1820	0.00	1.00
LAB pH			0.00	0.00	0.00
FIELD pH			0.00	0.00	0.00

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DROPPED HEAD; BEGIN SECTIONS HERE
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LITHOLOGIC LOG

WELL # NCRP #39AB
DATE COMPLETED 7/2/76

DEPTH ft	THICKNESS ft	DESCRIPTION
0'-19'	19'	Silt, Tan, Loose, Dry
19'-32'	13'	Sand, Pebbly, Dark Brown
32'-53'	21'	Sand, Pebbly, w/clay seams Dark Brown, Tan, Damp at 45'
53'-69'	16'	Gravel, Silty, Balls up (clay) Damp
69'-70'	1'	Dard Streak
70'-78'	8'	Gravel, Silty, Wet, Large Cobbles up to 1"
78'-80'	2'	Clay, Brown, Wet
80'-88'	8'	Sand, Medium, Greenishbrown Damp
88'-90'	2'	Sand, Medium, Grey, Soft
90'-98'	8'	Sand, Grey, Clayey, Wet
98'-99'	1'	Hard Sandstone Streak
99'-110'	11'	Sandstone, Grey, Clayey, Wet H_2O 98' 10 gal./min. TD H_2O 22 gal./min. at 110'

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3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP39A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3360

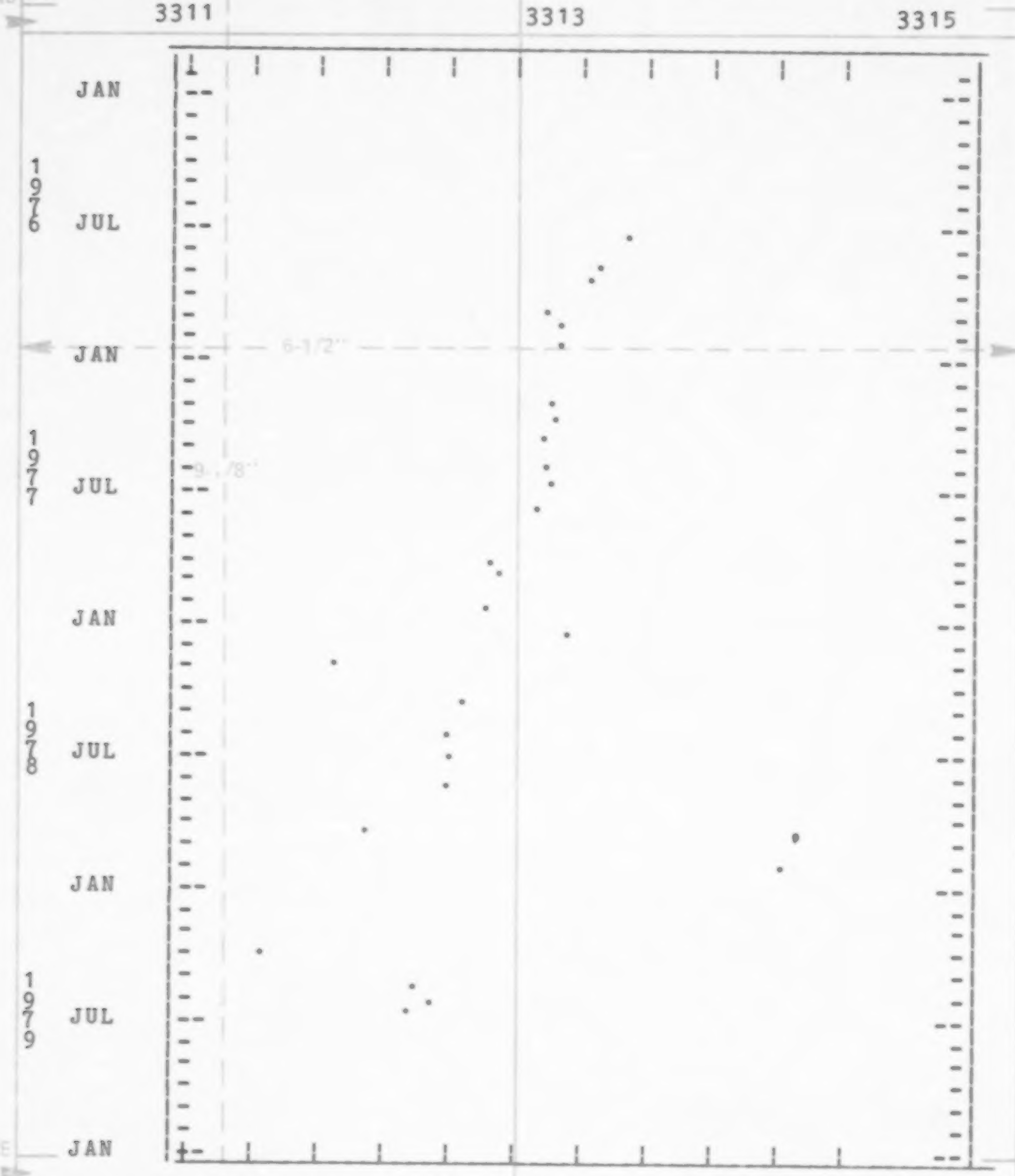
DATE	LEVEL	READING	CHANGE
7 19 1976	3313.49	46.51	00.00
8 27 1976	3313.33	46.67	00.16
9 14 1976	3313.28	46.72	00.05
10 29 1976	3313.03	46.97	00.25
11 16 1976	3313.11	46.89	-00.08
12 14 1976	3313.11	46.89	00.00
3 1 1977	3313.06	46.94	00.05
3 24 1977	3313.08	46.92	-00.02
4 22 1977	3313.01	46.99	00.07
5 31 1977	3313.03	46.97	-00.02
6 23 1977	3313.06	46.94	-00.03
7 29 1977	3312.98	47.02	00.08
10 11 1977	3312.72	47.28	00.26
10 27 1977	3312.77	47.23	-00.05
12 13 1977	3312.70	47.30	00.07
1 19 1978	3313.16	46.84	-00.46
2 28 1978	3311.84	48.16	01.32
4 21 1978	3312.57	47.43	-00.73
6 6 1978	3312.48	47.52	00.09
7 7 1978	3312.49	47.51	-00.01
8 18 1978	3312.48	47.52	00.01
10 19 1978	3312.02	47.98	00.46
12 6 1978	3314.37	45.63	-02.35
4 4 1979	3311.43	48.57	02.94
5 21 1979	3312.30	47.70	-00.87
6 11 1979	3312.39	47.61	-00.09
6 24 1979	3312.26	47.74	00.13
8 16 1979	3312.24	47.76	00.02

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP39A

WATER LEVEL (FEET ABOVE MSL)



EPA-287 (Cin.)
(4-76)

WELL NCRP 39A (ROSEBUD COAL AQUIFER) 1 of 2

DATE		091476	121476	032477	062377	101377
POTASSIUM	PPM	18.00	9.00	11.00	11.00	9.00
SODIUM	PPM	393	435	430	140	450
CALCIUM	PPM	156	130	125	177	109
MAGNESIUM	PPM	47.00	36.00	47.00	180	99.00
SULFATE	PPM	1345	1306	1313	1170	1310
CHLORIDE	PPM	14.00	13.00	9.00	13.00	11.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	68.00	49.00	146	390	366
FLOURIDE	PPM	0.30	0.30	0.30	0.31	0.44
SILICON DIO	PPM	10.00	12.00	14.00	10.00	8.00
TOTAL P	PPM	0.02	0.20	0.10	0.09	0.03
NITRATE	PPM	1.00	1.00	0.10	0.20	0.10
POTASSIUM	EPM	0.46	0.23	0.28	0.28	0.23
SODIUM	EPM	17.10	18.92	18.71	6.09	19.57
CALCIUM	EPM	7.78	6.49	6.24	8.83	5.44
MAGNESIUM	EPM	3.87	2.96	3.87	14.81	8.14
SULFATE	EPM	28.00	27.19	27.34	24.36	27.27
CHLORIDE	EPM	0.39	0.37	0.25	0.37	0.31
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	1.11	0.80	2.39	6.39	6.00
FLOURIDE	EPM	0.02	0.02	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		29.21	28.60	29.09	30.01	33.39
TOTAL ANIONS		29.42	28.28	29.93	31.04	33.53
DEVIATION		101	98.89	103	103	100
TDS (calc.)		2007	1953	2007	1883	2168
TDS @180		1994	1971	2045	1959	2198
TOTAL HARDNESS		580	472	504	1180	678
ALKALINITY		56.00	40.00	120	320	300
NON-CARB HARD		524	432	384	860	378
LAB CONDUCTIVITY		2400	2500	2800	2415	2842
FIELD COND.						2170
LAB pH		8.30	8.00	8.20	7.70	8.20
FIELD pH		7.00	8.50	7.90		

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 39A (ROSEBUD COAL AQUIFER) 2 of 2

DATE		121377	MEAN	ST.DEV	#
POTASSIUM	PPM	8.00	11.00	3.32	6.00
SODIUM	PPM	455	384	111	6.00
CALCIUM	PPM	109	134	24.76	6.00
MAGNESIUM	PPM	98.00	84.50	49.46	6.00
SULFATE	PPM	1309	1292	56.19	6.00
CHLORIDE	PPM	11.00	11.83	1.67	6.00
CARBONATE	PPM	0.00	0.00	0.00	6.00
BICARBONATE	PPM	378	233	148	6.00
FLOURIDE	PPM	0.42	0.34	0.06	6.00
SILICON DIO	PPM	12.00	11.00	1.91	6.00
TOTAL P	PPM	0.01	0.07	0.07	6.00
NITRATE	PPM	0.10	0.28	0.51	6.00
POTASSIUM	EPM	0.20	0.28		
SODIUM	EPM	19.79	16.70		
CALCIUM	EPM	5.44	6.70		
MAGNESIUM	EPM	8.06	6.95		
SULFATE	EPM	27.25	26.90		
CHLORIDE	EPM	0.31	0.33		
CARBONATE	EPM	0.00	0.00		
BICARBONATE	EPM	6.20	3.82		
FLOURIDE	EPM	0.02	0.02		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		33.50	30.63	2.03	6.00
TOTAL ANIONS		33.70	30.98	2.03	6.00
DEVIATION		101	101	1.55	6.00
TDS (calc.)		2176	2032	107	6.00
TDS @180		2244	2068	112	6.00
TOTAL HARDNESS		674	681	236	6.00
ALKALINITY		310	191	122	6.00
NON-CARB HARD		364	490	174	6.00
LAB CONDUCTIVITY		2842	2633	198	6.00
FIELD COND.		1780	1975	195	2.00
LAB pH		8.00	8.07	0.20	6.00
FIELD pH		7.60	7.75	0.54	4.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP39B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3360

DATE	LEVEL	READING	CHANGE
7 19 1976	3310.14	49.86	00.00
8 27 1976	3310.63	49.37	-00.49
9 14 1976	3310.93	49.07	-00.30
10 29 1976	3310.54	49.46	00.39
11 16 1976	3310.73	49.27	-00.19
12 14 1976	3311.10	48.90	-00.37
3 1 1977	3310.11	49.89	00.99
3 24 1977	3310.36	49.64	-00.25
4 22 1977	3319.72	40.28	-09.36
5 31 1977	3309.53	50.47	10.19
6 23 1977	3310.49	49.51	-00.96
7 29 1977	3307.34	52.66	03.15
10 11 1977	3309.06	50.94	-01.72
10 27 1977	3310.59	49.41	-01.53
12 13 1977	3310.88	49.12	-00.29
1 19 1978	3309.84	50.16	01.04
2 28 1978	3309.21	50.79	00.63
4 21 1978	3310.10	49.90	-00.89
6 6 1978	3310.39	49.61	-00.29
7 7 1978	3310.51	49.49	-00.12
8 18 1978	3310.77	49.23	-00.26
10 19 1978	3310.96	49.04	-00.19
4 3 1979	3312.17	47.83	-01.21
5 21 1979	3311.55	48.45	00.62
6 11 1979	3311.94	48.06	-00.39
7 24 1979	3311.68	48.32	00.26
8 16 1979	3311.75	48.25	-00.07

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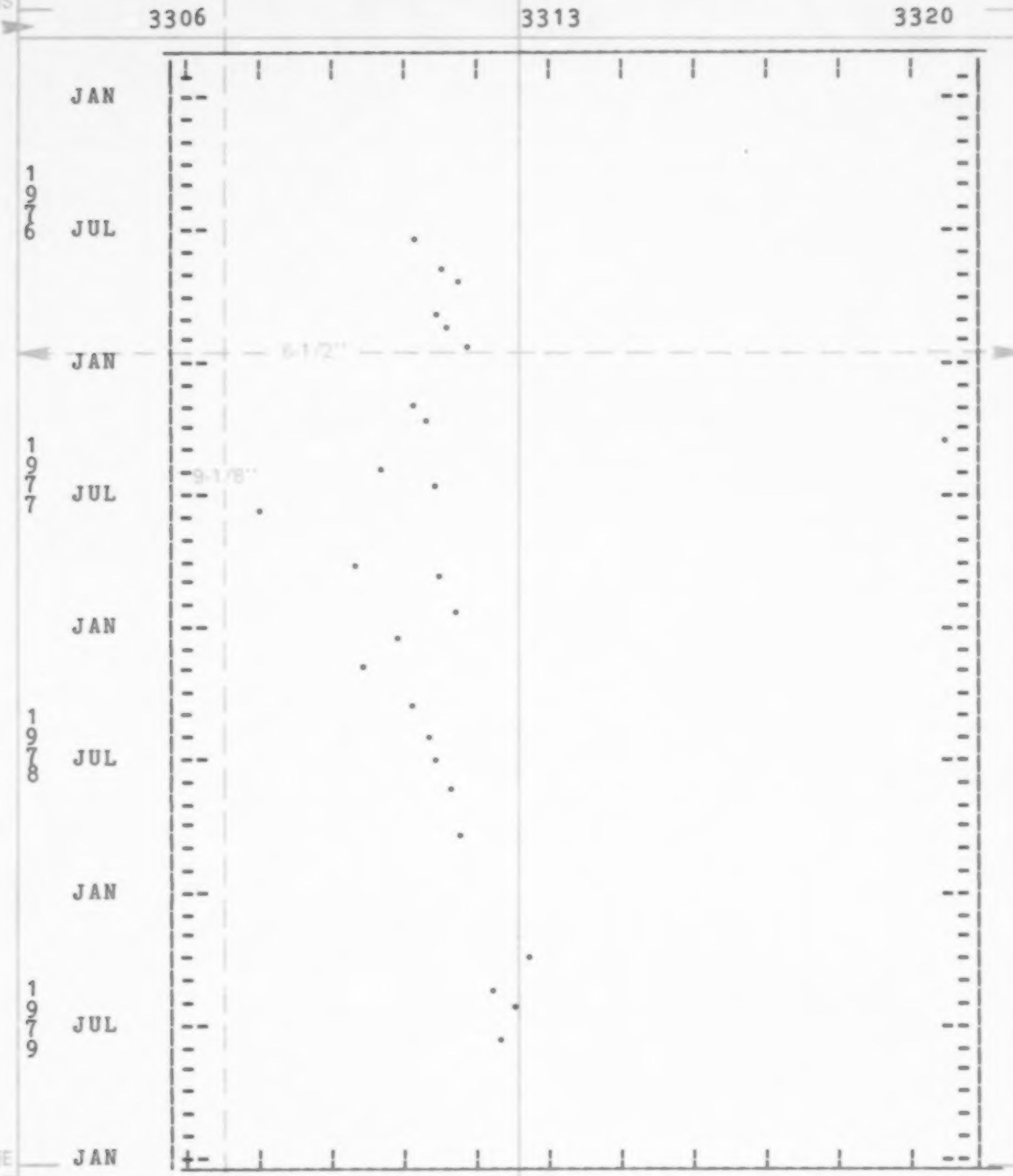
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-75)

HYDROGRAPH FOR WELL NCRP39B

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 39B (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		032477	062377	121377
POTASSIUM	PPM	12.00	8.00	12.00
SODIUM	PPM	140	450	0.00
CALCIUM	PPM	195	118	151
MAGNESIUM	PPM	176	80.00	191
SULFATE	PPM	1177	1322	1154
CHLORIDE	PPM	11.00	10.00	8.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	342	268	366
FLOURIDE	PPM	0.30	0.37	0.38
SILICON DIO	PPM	62.00	10.00	14.00
TOTAL P	PPM	0.15	0.01	0.01
NITRATE	PPM	0.30	0.20	0.10
POTASSIUM	EPM	0.31	0.20	0.31
SODIUM	EPM	6.09	19.57	0.00
CALCIUM	EPM	9.73	5.89	7.53
MAGNESIUM	EPM	14.48	6.58	15.71
SULFATE	EPM	24.51	27.52	24.03
CHLORIDE	EPM	0.31	0.28	0.23
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	5.61	4.39	6.00
FLOURIDE	EPM	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		30.61	32.25	23.55
TOTAL ANIONS		30.36	32.14	30.21
DEVIATION		99.19	99.68	128
TDS (calc.)		1879	2120	1836
TDS @180		2048	2205	1854
TOTAL HARDNESS		1207	625	1163
ALKALINITY		280	220	300
NON-CARB HARD		927	405	863
LAB CONDUCTIVITY		2600	2910	2303
FIELD COND.				530
LAB pH		7.80	7.60	8.20
FIELD pH		7.00		7.56

EPA-287 (Cin.)
(4-76)

WELL NCRP 39B (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	10.67	1.89	3.00
SODIUM	PPM	197	188	3.00
CALCIUM	PPM	155	31.54	3.00
MAGNESIUM	PPM	149	49.17	3.00
SULFATE	PPM	1218	74.37	3.00
CHLORIDE	PPM	9.67	1.25	3.00
CARBONATE	PPM	0.00	0.00	3.00
BICARBONATE	PPM	325	41.71	3.00
FLOURIDE	PPM	0.35	0.04	3.00
SILICON DIO	PPM	28.67	23.63	3.00
TOTAL P	PPM	0.04	0.08	3.00
NITRATE	PPM	0.20	0.08	3.00
POTASSIUM	EPM	0.27		
SODIUM	EPM	8.56		
CALCIUM	EPM	7.72		
MAGNESIUM	EPM	12.26		
SULFATE	EPM	25.35		
CHLORIDE	EPM	0.27		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	5.33		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		28.80	3.77	3.00
TOTAL ANIONS		30.90	0.88	3.00
DEVIATION		109	13.59	3.00
TDS (calc.)		1945	125	3.00
TDS @180		2036	144	3.00
TOTAL HARDNESS		998	265	3.00
ALKALINITY		267	33.99	3.00
NON-CARB HARD		732	232	3.00
LAB CONDUCTIVITY		2604	248	3.00
FIELD COND.		530	0.00	1.00
LAB pH		7.87	0.25	3.00
FIELD pH		7.28	0.28	2.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well #NCRP #1A-B
Date Completed 11/13/75

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0-8'	8'	Sandy, Clay, Light Brown
8'-13'	5'	Clayey Sand, Light Brown
13-20	7'	Sandy, Clay, Light Brown (H_2O) Damp
20-25	5	Clay, Orange
25-30	5	Shale, Orange
30-40	10	Coal, Black, Dry
40-43	3	Shale, Gray
43-44	1	Coal, Brown, Dry
44-45	1	Shale, Gray
45-55	10	Coal, Black, Dry
55-63	8	Shale, Gray
63-66	3	Sandstone, Gray, Fine
66-67	1	Coal
67-72	5	Clayey, Sandstone, Gray Fine
72-73	1	Shale, Red or Orange?
73-75	2	Clayey, Sandstone, Gray Fine

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

#1 A-B continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
75.5-76	.5	Sandstone, Brown, Fine, Organic
76-77	1	Clayey, Sandstone, Gray, Fine
77-77.5	.5	Sandstone, Bronw, Fine, Organic
77.5-80	.5	Shale, Gray, Fine
80-85	5	Clayey, Sandstone, Gray Fine
85-89	4	Shale, Gray, Hard
89-90	5	Sandstone, Brown, Organic, Fine
90-100	10	Coal, Brown, Dry
100-108	8	Shale, Gray, Brown, (H_2O) 101-102
108-116	8	Clayey, Sandstone, Gray, Fine, Hard
116-120	4	Shale, Tan
120-130	10	Water, for return, NR
130-150	20	Sandy, Shale, Gray, Hard (140)
150-175	25	Shale, Gray
175-200	25	Coal, Brown, Dry (185' NR, 190' NR)
		Air

EPA-287 (Cin.)
(4-76)

WELL NCRP1A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4060

DATE	LEVEL	READING	CHANGE
2 10 1976	3945.54	114.46	00.00
5 18 1976	3946.48	113.52	-00.94
6 9 1976	3947.43	112.57	-00.95
6 29 1976	3947.43	112.57	00.00
9 2 1976	3945.63	114.37	01.80
9 28 1976	3945.95	114.05	-00.32
10 28 1976	3943.43	116.57	02.52
11 16 1976	3944.23	115.77	-00.80
12 9 1976	3945.09	114.91	-00.86
2 1 1977	3944.52	115.48	00.57
4 27 1977	3946.67	113.33	-02.15

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 1A (KNOBLOCH COAL AQUIFER) 1 of 2

DATE		021076	062976	092876	120876	042777
POTASSIUM	PPM	11.00	11.00	15.00	11.00	16.00
SODIUM	PPM	169	148	136	131	160
CALCIUM	PPM	18.00	20.00	26.00	28.00	26.00
MAGNESIUM	PPM	5.00	4.00	12.00	10.00	8.00
SULFATE	PPM	329	332	330	305	288
CHLORIDE	PPM	3.00	6.00	8.00	4.00	10.00
CARBONATE	PPM	42.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	5.00	76.00	88.00	129	177
FLOURIDE	PPM	1.80	1.70	1.80	1.40	1.70
SILICON DIO	PPM	15.00	7.00	11.00	17.00	14.00
TOTAL P	PPM	0.30	0.02	0.30	0.41	0.58
NITRATE	PPM	0.30	1.00	3.00	3.00	0.22
POTASSIUM	EPM	0.28	0.28	0.38	0.28	0.41
SODIUM	EPM	7.35	6.44	5.92	5.70	6.96
CALCIUM	EPM	0.90	1.00	1.30	1.40	1.30
MAGNESIUM	EPM	0.41	0.33	0.99	0.82	0.66
SULFATE	EPM	6.85	6.91	6.87	6.35	6.00
CHLORIDE	EPM	0.08	0.17	0.23	0.11	0.28
CARBONATE	EPM	1.40	0.00	0.00	0.00	0.00
BICARBONATE	EPM	0.08	1.25	1.44	2.11	2.90
FLOURIDE	EPM	0.09	0.09	0.09	0.07	0.09
NITRATE	EPM	0.00	0.00	0.00	0.01	0.01
TOTAL CATIONS		8.94	8.05	8.58	8.20	9.32
TOTAL ANIONS		8.49	8.37	8.58	8.63	9.20
DEVIATION		94.98	104	99.94	105	98.71
TDS (calc.)		582	558	570	553	595
TDS @180		588	571	594	599	608
TOTAL HARDNESS		65.00	67.00	114	111	97.00
ALKALINITY		85.00	62.00	72.00	106	145
NON-CARB HARD		0.00	5.00	42.00	5.00	0.00
LAB CONDUCTIVITY		900	800	800	900	1007
FIELD COND.						
LAB pH			7.00	7.20	7.20	7.60
FIELD pH			8.20	6.90	7.30	7.30

EPA-287 (Cin.)
(4-76)

WELL NCRP 1A (KNOBLOCH COAL AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	12.80	2.23	5.00
SODIUM	PPM	149	14.25	5.00
CALCIUM	PPM	23.60	3.88	5.00
MAGNESIUM	PPM	7.80	2.99	5.00
SULFATE	PPM	317	17.45	5.00
CHLORIDE	PPM	6.20	2.56	5.00
CARBONATE	PPM	8.40	16.80	5.00
BICARBONATE	PPM	95.00	57.25	5.00
FLOURIDE	PPM	1.68	0.15	5.00
SILICON DIO	PPM	12.80	3.49	5.00
TOTAL P	PPM	0.32	0.18	5.00
NITRATE	PPM	1.10	1.62	5.00
POTASSIUM	EPM	0.33		
SODIUM	EPM	6.47		
CALCIUM	EPM	1.18		
MAGNESIUM	EPM	0.64		
SULFATE	EPM	6.60		
CHLORIDE	EPM	0.17		
CARBONATE	EPM	0.28		
BICARBONATE	EPM	1.56		
FLOURIDE	EPM	0.09		
NITRATE	EPM	0.01		
TOTAL CATIONS		8.62	0.47	5.00
TOTAL ANIONS		8.66	0.29	5.00
DEVIATION		101	3.71	5.00
TDS (calc.)		572	15.42	5.00
TDS @180		592	12.38	5.00
TOTAL HARDNESS		90.80	21.06	5.00
ALKALINITY		94.00	29.44	5.00
NON-CARB HARD		10.40	15.96	5.00
LAB CONDUCTIVITY		881	77.10	5.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.25	0.22	4.00
FIELD pH		7.42	0.48	4.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP1B

GROUNDWATER LEVELS (FEET--DATUM MSL)

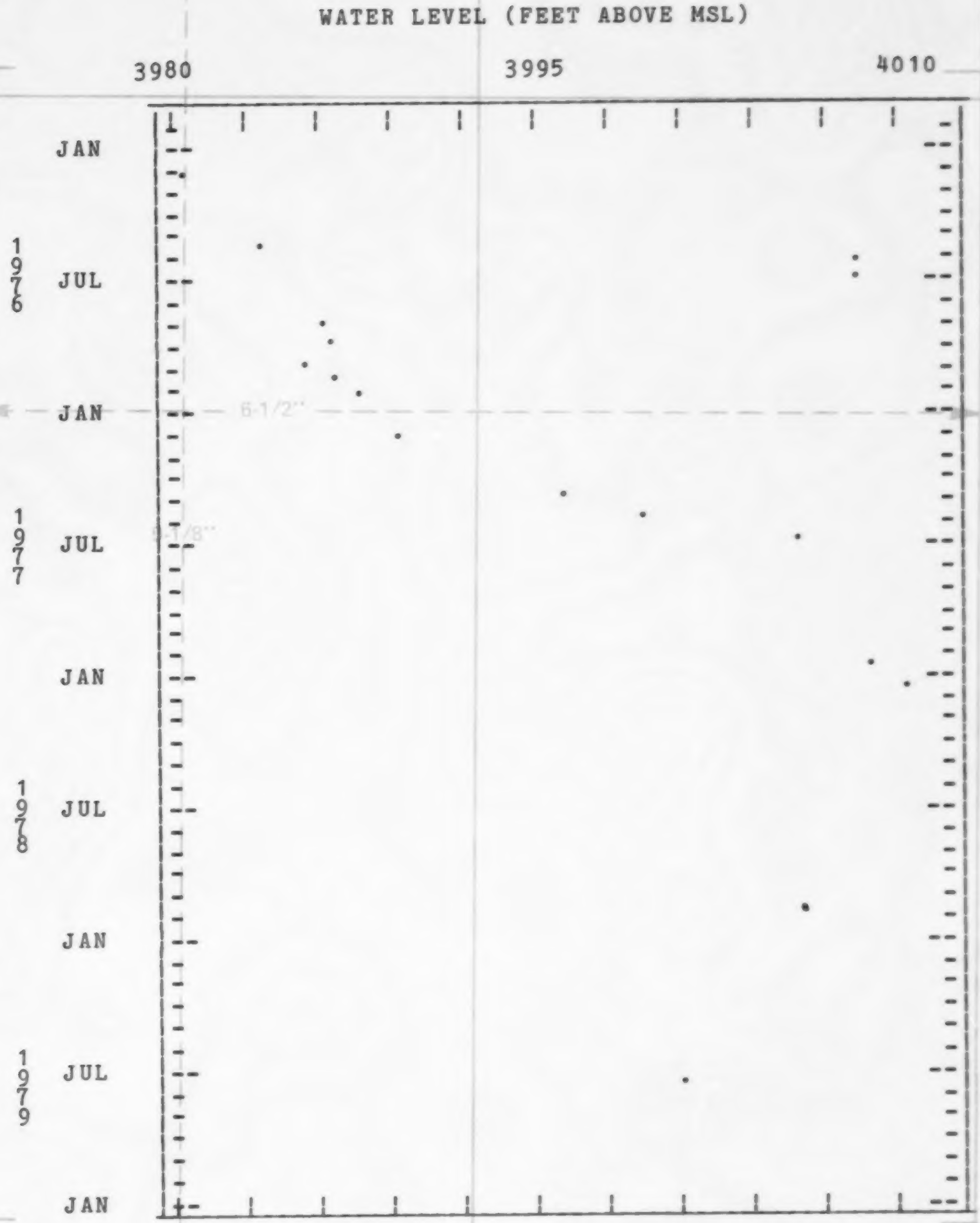
elevation at top of well casing is 4060

DATE	LEVEL	READING	CHANGE
2 10 1976	3981.66	78.34	00.00
5 18 1976	3984.66	75.34	-03.00
6 9 1976	4007.75	52.25	-23.09
6 29 1976	4007.75	52.25	00.00
9 2 1976	3987.05	72.95	20.70
9 28 1976	3987.39	72.61	-00.34
10 28 1976	3986.40	73.60	00.99
11 16 1976	3987.50	72.50	-01.10
12 9 1976	3988.41	71.59	-00.91
2 4 1977	3989.97	70.03	-01.56
4 27 1977	3996.38	63.62	-06.41
5 27 1977	3999.46	60.54	-03.08
6 28 1977	4005.48	54.52	-06.02
8 30 1977	4010.02	49.98	-04.54
10 20 1977	4010.83	49.17	-00.81
12 16 1977	4008.22	51.78	02.61
1 19 1978	4009.67	50.33	-01.45
6 6 1978	4010.72	49.28	-01.05
7 20 1979	4000.98	59.02	09.74
8 21 1979	4000.26	59.74	00.72

6-1/2
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP1B



6-1/2"
9-1/8"
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3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 1B 1 of 3

DATE		121677	021076	062976	092876	120876
POTASSIUM	PPM	21.00	30.00	15.00	15.00	33.00
SODIUM	PPM	107	200	135	150	110
CALCIUM	PPM	612	321	107	372	510
MAGNESIUM	PPM	6.00	5.00	2.00		1.00
SULFATE	PPM	1.00	605	249	109	58.00
CHLORIDE	PPM	7.00	13.00	27.00	12.00	4.00
CARBONATE	PPM	72.00	37.00	12.00	48.00	36.00
BICARBONATE	PPM	585	197	92.00	368	496
FLOURIDE	PPM	0.21	0.50	0.70	0.40	1.40
SILICON DIO	PPM	1.00	19.00	6.00	3.00	1.00
TOTAL P	PPM	0.02	0.10	0.04	0.02	0.41
NITRATE	PPM	4.40	3.00	1.00	5.00	3.00
POTASSIUM	EPM	0.54	0.77	0.38	0.38	0.84
SODIUM	EPM	4.65	8.70	5.87	6.52	4.78
CALCIUM	EPM	30.54	16.02	5.34	18.56	25.45
MAGNESIUM	EPM	0.49	0.41	0.16		0.08
SULFATE	EPM	0.02	12.60	5.18	2.27	1.21
CHLORIDE	EPM	0.20	0.37	0.76	0.34	0.11
CARBONATE	EPM	2.40	1.23	0.40	1.60	1.20
BICARBONATE	EPM	9.59	3.23	1.51	6.03	8.13
FLOURIDE	EPM	0.01	0.03	0.04	0.02	0.07
NITRATE	EPM	0.00	0.00	0.00	0.00	0.01
TOTAL CATIONS		36.22	25.90	11.76	108	31.00
TOTAL ANIONS		12.17	17.36	7.69	10.17	10.70
DEVIATION		33.59	67.02	65.40	9.45	34.52
TDS (calc.)		1411	1408	639	1074	1247
TDS @180		1611	1544	767	1310	1137
TOTAL HARDNESS		1550	819	278	928	1198
ALKALINITY		1840	640	310	1160	1430
NON-CARB HARD		0.00	179	0.00	0.00	0.00
LAB CONDUCTIVITY			2700	2100	4500	
FIELD COND.		5400				
LAB pH						
FIELD pH						

WELL NCRP 1B

DATE		042877	062877	102077
POTASSIUM	PPM	23.00	22.00	16.00
SODIUM	PPM	120	90.00	120
CALCIUM	PPM	585	603	728
MAGNESIUM	PPM	2.00	5.00	6.00
SULFATE	PPM	8.00	33.00	3.00
CHLORIDE	PPM	5.00	11.00	39.00
CARBONATE	PPM	144	60.00	48.00
BICARBONATE	PPM	497	544	700
FLOURIDE	PPM	0.29	0.29	0.18
SILICON DIO	PPM	2.00	2.00	1.00
TOTAL P	PPM	0.19	0.17	0.11
NITRATE	PPM	1.00	0.60	0.56
POTASSIUM	EPM	0.59	0.56	0.41
SODIUM	EPM	5.22	3.91	5.22
CALCIUM	EPM	29.19	30.09	36.33
MAGNESIUM	EPM	0.16	0.41	0.49
SULFATE	EPM	0.17	0.69	0.06
CHLORIDE	EPM	0.14	0.31	1.10
CARBONATE	EPM	4.80	2.00	1.60
BICARBONATE	EPM	8.15	8.92	11.47
FLOURIDE	EPM	0.02	0.02	0.01
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		35.16	34.98	42.45
TOTAL ANIONS		13.23	11.85	13.96
DEVIATION		37.64	33.88	32.88
TDS (calc.)		1384	1368	1660
TDS @180		1487	1550	1626
TOTAL HARDNESS		1468	1523	1840
ALKALINITY		1700	1700	
NON-CARB HARD		0.00	0.00	0.00
LAB CONDUCTIVITY				
FIELD COND.				7100
LAB pH				
FIELD pH				

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
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(4-76)

WELL NCRP 1B

3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	21.88	6.33	8.00
SODIUM	PPM	129	31.71	8.00
CALCIUM	PPM	480	188	8.00
MAGNESIUM	PPM	3.57	2.44	7.00
SULFATE	PPM	133	194	8.00
CHLORIDE	PPM	14.75	11.37	8.00
CARBONATE	PPM	57.12	36.79	8.00
BICARBONATE	PPM	435	191	8.00
FLOURIDE	PPM	0.50	0.38	8.00
SILICON DIO	PPM	4.12	5.93	8.00
TOTAL P	PPM	0.13	0.12	8.00
NITRATE	PPM	2.07	1.96	8.00
POTASSIUM	EPM	0.56		
SODIUM	EPM	5.61		
CALCIUM	EPM	23.94		
MAGNESIUM	EPM	0.29		
SULFATE	EPM	2.77		
CHLORIDE	EPM	0.42		
CARBONATE	EPM	1.90		
BICARBONATE	EPM	7.13		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.00		
TOTAL CATIONS		40.64	26.74	8.00
TOTAL ANIONS		12.14	2.68	8.00
DEVIATION		39.30	17.57	8.00
TDS (calc.)		1274	285	8.00
TDS @180		1379	279	8.00
TOTAL HARDNESS		1200	471	8.00
ALKALINITY		1254	541	7.00
NON-CARB HARD		22.37	59.20	8.00
LAB CONDUCTIVITY		3100	1020	3.00
FIELD COND.		6250	850	2.00
LAB pH		0.00	0.00	0.00
FIELD pH		0.00	0.00	0.00

LITHOLOGIC LOG

Well #NCRP #2A-2B
Date completed 11/13/75

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0-16	16	Sandy, Clay, Brown, Damp, Balling
16-18	2	Sandstone, Tan, Fine
18-25	7	Sandstone, Orange, Damp
25-26	1	Sandstone, Gray, Fine
26-29	3	Sandstone, Orange, Fine
29-33	4	Clayey, Sandstone, Orange Fine, Gray Layers
33-47	14	Clayey, Sandstone, Gray Fine, Balling
47-70	23	Clayey, Sandstone, Orange, Fine
70-80	10	Coal, Black at 75 no return
80.93	13	Sandy, Shale, Brown
93-95	2	Coal
95-100	5	Shale, Gray
100-123	23	Clayey, Sandstone, Gray, Fine
123-127	4	Shale, Brown, Organic
127-129	2	Coal Brown
129-130	1	Shale, Gary Brown

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#2A-2B continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
130-141	11	Sandstone, Gray, Fine (H_2O) Moist, Balling
141-154	13	Silty
154-156	2	Sandy Shale, Gray, Coal
156-167	11	Sandy Shale, Gray
167-193	16	Clayey Sandstone, Gray, Fine
193-200	7	Sandy Shale, Gray
200-205	5	Shale, Sandstone, Gray, Fine
205-240	35	Sandy Shale, Gray

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9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

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EPA-287 (Cin.)
(4-76)

WELL NCRP2A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4580

DATE	LEVEL	READING	CHANGE
5 18 1976	4421.90	158.10	00.00
6 9 1976	4422.56	157.44	-00.66
6 29 1976	4422.56	157.44	00.00
9 28 1976	4421.73	158.27	00.83
10 28 1976	4422.04	157.96	-00.31
11 16 1976	4421.98	158.02	00.06
12 7 1976	4423.10	156.90	-01.12
4 27 1977	4423.29	156.71	-00.19
5 27 1977	4423.38	156.62	-00.09
6 28 1977	4423.19	156.81	00.19
7 27 1977	4422.20	157.80	00.99
8 30 1977	4422.92	157.08	-00.72
10 20 1977	4422.90	157.10	00.02
12 16 1977	4423.46	156.54	-00.56
6 6 1978	4424.33	155.67	-00.87
8 18 1978	4423.56	156.44	00.77
6 13 1979	4424.64	155.36	-01.08
6 13 1979	4424.64	155.36	00.00
7 20 1979	4424.32	155.68	00.32
8 21 1979	4424.27	155.73	00.05

6-1/2"

9-1/8"

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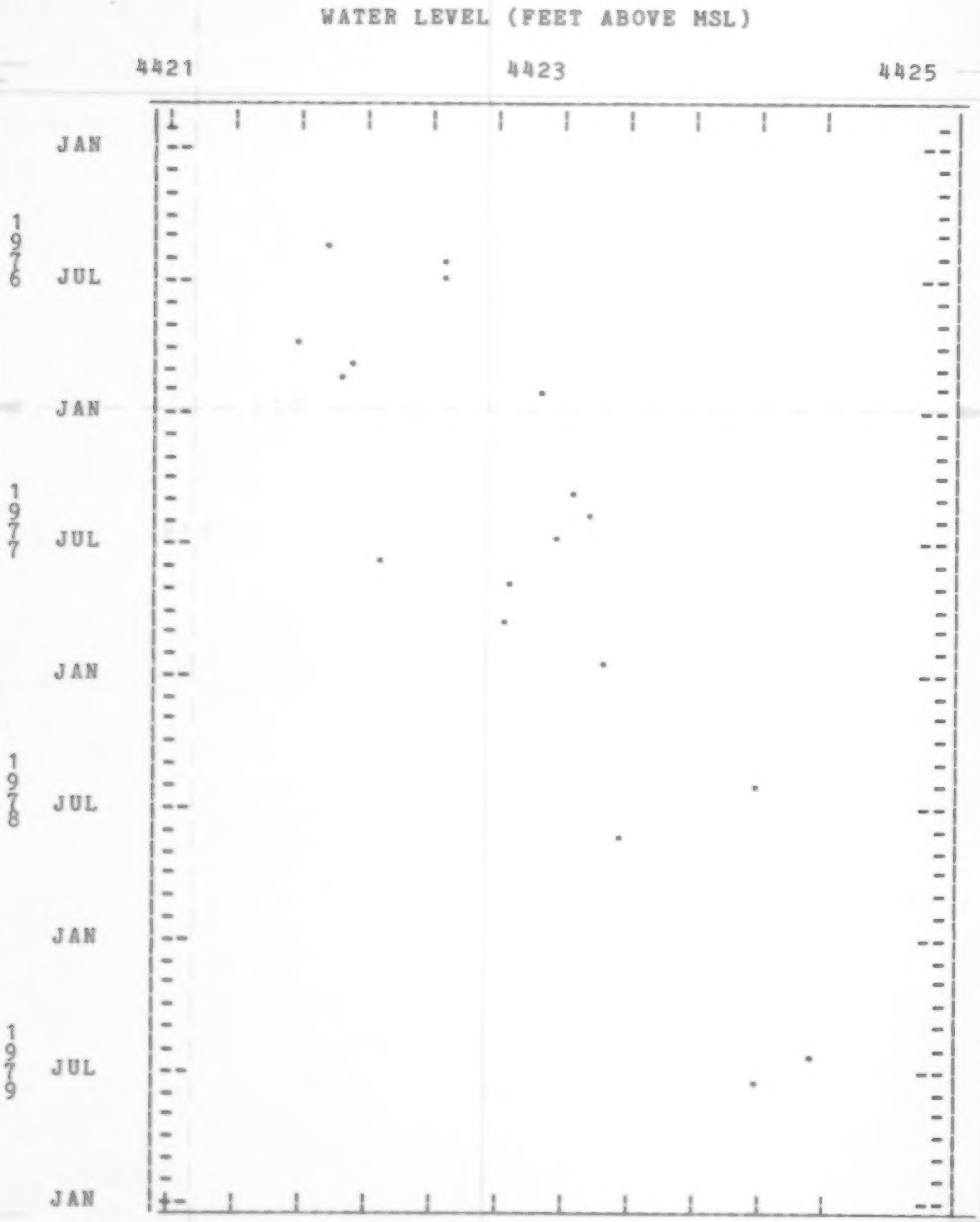
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP2A



WELL NCRP 2A

DATE		062976	092876	120776	042777	062877
POTASSIUM	PPM	10.00	15.00	8.00	18.00	23.00
SODIUM	PPM	107	120	110	120	100.00
CALCIUM	PPM	246	240	172	206	130
MAGNESIUM	PPM	1.00		1.00	2.00	2.00
SULFATE	PPM	514	524	486	461	408
CHLORIDE	PPM	19.00	12.00	42.00	7.00	16.00
CARBONATE	PPM	12.00	24.00	16.00	42.00	12.00
BICARBONATE	PPM	95.00	102	55.00	85.00	32.00
FLOURIDE	PPM	0.40	6.60	0.40	0.37	0.34
SILICON DIO	PPM	3.00	5.00	6.00	6.00	9.00
TOTAL P	PPM	0.02	0.03	0.01	0.05	0.14
NITRATE	PPM	4.00	3.00	3.00	0.16	0.80
POTASSIUM	EPM	0.26	0.38	0.20	0.46	0.59
SODIUM	EPM	4.65	5.22	4.78	5.22	4.35
CALCIUM	EPM	12.28	11.98	8.58	10.28	6.49
MAGNESIUM	EPM	0.08		0.08	0.16	0.16
SULFATE	EPM	10.70	10.91	10.12	9.60	8.49
CHLORIDE	EPM	0.54	0.34	1.18	0.20	0.45
CARBONATE	EPM	0.40	0.80	0.53	1.40	0.40
BICARBONATE	EPM	1.56	1.67	0.90	1.39	0.52
FLOURIDE	EPM	0.02	0.35	0.02	0.02	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		17.27	99.76	13.49	16.12	11.59
TOTAL ANIONS		13.08	13.98	12.45	12.56	9.77
DEVIATION		75.72	14.01	92.28	77.88	84.32
TDS (calc.)		1004	1037	890	941	723
TDS @180		1088	977	1075	1001	747
TOTAL HARDNESS		617	599	419	523	334
ALKALINITY		300	300	190	320	115
NON-CARB HARD		317	299	229	203	219
LAB CONDUCTIVITY		2500	2000	2100	2043	1520
FIELD COND.						
LAB pH						
FIELD pH						

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
1/2"
9-1/8"
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

WELL NCRP 2A 2 of 2

DATE		121677	MEAN	ST.DEV	#
POTASSIUM	PPM	16.00	15.00	4.97	6.00
SODIUM	PPM	197	126	32.67	6.00
CALCIUM	PPM	43.00	173	70.31	6.00
MAGNESIUM	PPM	15.00	3.80	5.71	5.00
SULFATE	PPM	446	473	39.89	6.00
CHLORIDE	PPM	19.00	19.17	11.04	6.00
CARBONATE	PPM	10.00	19.33	11.12	6.00
BICARBONATE	PPM	151	86.67	37.50	6.00
FLOURIDE	PPM	0.28	1.40	2.33	6.00
SILICON DIO	PPM	33.00	10.33	10.29	6.00
TOTAL P	PPM	0.01	0.04	0.05	6.00
NITRATE	PPM	0.10	1.84	1.54	6.00
POTASSIUM	EPM	0.41	0.38		
SODIUM	EPM	8.57	5.47		
CALCIUM	EPM	2.15	8.62		
MAGNESIUM	EPM	1.23	0.31		
SULFATE	EPM	9.29	9.85		
CHLORIDE	EPM	0.54	0.54		
CARBONATE	EPM	0.33	0.64		
BICARBONATE	EPM	2.47	1.42		
FLOURIDE	EPM	0.01	0.07		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		12.36	28.43	31.96	6.00
TOTAL ANIONS		12.50	12.39	1.28	6.00
DEVIATION		101	74.23	28.27	6.00
TDS (calc.)		821	903	107	6.00
TDS @180		852	957	121	6.00
TOTAL HARDNESS		169	443	157	6.00
ALKALINITY		140	227	82.45	6.00
NON-CARB HARD		29.00	216	93.46	6.00
LAB CONDUCTIVITY		1098	1877	450	6.00
FIELD COND.		770	770	0.00	1.00
LAB pH		8.50	8.50	0.00	1.00
FIELD pH			0.00	0.00	0.00

EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP2B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4580

DATE	LEVEL	READING	CHANGE
5 18 1976	4465.36	114.64	00.00
6 9 1976	4464.09	115.91	01.27
6 29 1976	4466.09	113.91	-02.00
9 28 1976	4460.48	119.52	05.61
10 28 1976	4456.35	123.65	04.13
11 16 1976	4456.32	123.68	00.03
12 7 1976	4456.49	123.51	-00.17
4 27 1977	4453.81	126.19	02.68
5 27 1977	4450.92	129.08	02.89
6 28 1977	4451.34	128.66	-00.42
7 27 1977	4449.21	130.79	02.13
8 30 1977	4449.55	130.45	-00.34
10 20 1977	4450.30	129.70	-00.75
12 16 1977	4446.38	133.62	03.92
6 6 1978	4447.05	132.95	-00.67
8 18 1978	4448.03	131.97	-00.98
6 13 1979	4451.85	128.15	-03.82
7 20 1979	4451.98	128.02	-00.13
8 21 1979	4452.19	127.81	-00.21

6-1/2"
9-1/8"
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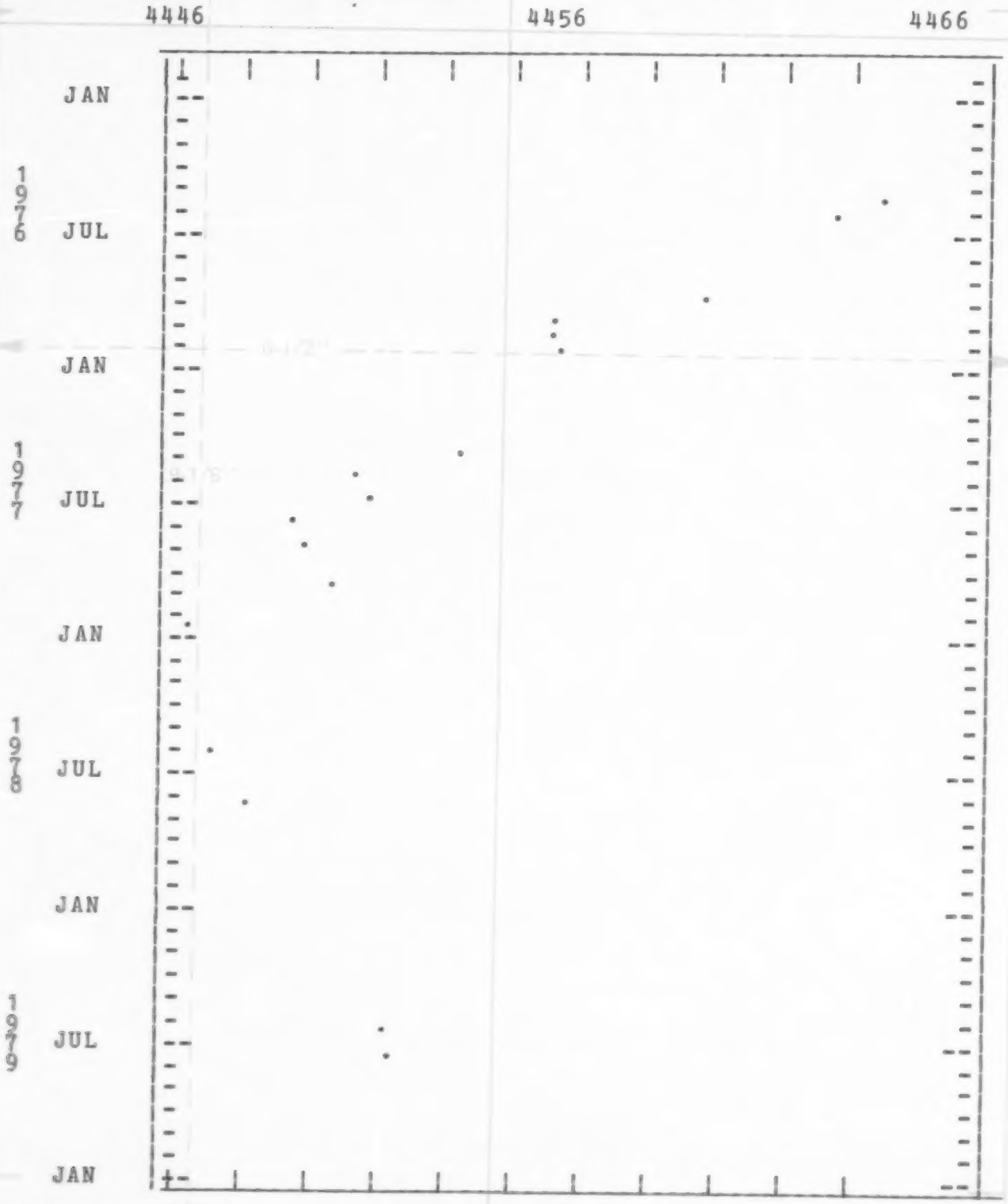
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP2B

WATER LEVEL (FEET ABOVE MSL)



PAGE NUMBER
EPA-287 (Cin.) (4-76)

WELL NCRP 2B (DIETZ #1 COAL AQUIFER) 1 of 2

DATE		062976	092876	120776	042777	062877
POTASSIUM	PPM	8.00	15.00	10.00	20.00	22.00
SODIUM	PPM	61.00	105	71.00	54.00	58.00
CALCIUM	PPM	268	260	118	6.00	67.00
MAGNESIUM	PPM	1.00		1.00	24.00	4.00
SULFATE	PPM	319	308	291	221	216
CHLORIDE	PPM	18.00	11.00	25.00	9.00	12.00
CARBONATE	PPM	24.00	30.00	22.00	10.00	19.00
BICARBONATE	PPM	153	174	45.00	0.00	68.00
FLOURIDE	PPM	0.40	0.40	0.30	0.25	0.28
SILICON DIO	PPM	4.00	4.00	9.00	10.00	32.00
TOTAL P	PPM	2.00	0.04	0.27	0.05	0.39
NITRATE	PPM	0.02	2.00	3.00	0.67	0.70
POTASSIUM	EPM	0.20	0.38	0.26	0.51	0.56
SODIUM	EPM	2.65	4.57	3.09	2.35	2.52
CALCIUM	EPM	13.37	12.97	5.89	0.30	3.34
MAGNESIUM	EPM	0.08		0.08	1.97	0.33
SULFATE	EPM	6.64	6.41	6.06	4.60	4.50
CHLORIDE	EPM	0.51	0.31	0.71	0.25	0.34
CARBONATE	EPM	0.80	1.00	0.73	0.33	0.63
BICARBONATE	EPM	2.51	2.85	0.74	0.00	1.11
FLOURIDE	EPM	0.02	0.02	0.02	0.01	0.01
NITRATE	EPM	0.03	0.00	0.00	0.00	0.01
TOTAL CATIONS		16.31	100	9.15	5.13	6.76
TOTAL ANIONS		10.38	10.52	8.07	5.14	6.52
DEVIATION		63.61	10.50	88.19	100	96.42
TDS (calc.)		852	903	582	344	432
TDS @180		954	949	799	300	425
TOTAL HARDNESS		674	648	294	111	182
ALKALINITY		490	560	168	20.00	88.00
NON-CARB HARD		184	88.00	126	91.00	94.00
LAB CONDUCTIVITY		2700	2400	1550	589	684
FIELD COND.						
LAB pH					9.20	8.60
FIELD pH						

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 2B (DIETZ #1 COAL AQUIFER) 2 of 2

DATE		102077	121677	MEAN	ST.DEV	#
POTASSIUM	PPM	18.00	15.00	15.43	4.72	7.00
SODIUM	PPM	140	60.00	78.43	29.78	7.00
CALCIUM	PPM	142	39.00	129	95.50	7.00
MAGNESIUM	PPM	1.00	1.00	5.00	8.62	6.00
SULFATE	PPM	498	191	292	95.95	7.00
CHLORIDE	PPM	8.00	10.00	13.29	5.65	7.00
CARBONATE	PPM	24.00	14.00	20.43	6.23	7.00
BICARBONATE	PPM	44.00	20.00	72.00	61.39	7.00
FLOURIDE	PPM	0.30	0.36	0.33	0.06	7.00
SILICON DIO	PPM	19.00	9.00	12.43	9.24	7.00
TOTAL P	PPM	0.33	0.01	0.44	0.65	7.00
NITRATE	PPM	0.10	1.60	1.13	1.04	7.00
POTASSIUM	EPM	0.46	0.38	0.39		
SODIUM	EPM	6.09	2.61	3.41		
CALCIUM	EPM	7.09	1.95	6.42		
MAGNESIUM	EPM	0.08	0.08	0.41		
SULFATE	EPM	10.37	3.98	6.08		
CHLORIDE	EPM	0.23	0.28	0.37		
CARBONATE	EPM	0.80	0.47	0.68		
BICARBONATE	EPM	0.72	0.33	1.18		
FLOURIDE	EPM	0.02	0.02	0.02		
NITRATE	EPM	0.01	0.00	0.01		
TOTAL CATIONS		13.72	5.02	22.31	32.01	7.00
TOTAL ANIONS		12.08	5.00	8.24	2.61	7.00
DEVIATION		88.04	99.52	78.05	29.89	7.00
TDS (calc.)		875	340	618	236	7.00
TDS @180		1092	372	699	301	7.00
TOTAL HARDNESS		358	102	338	221	7.00
ALKALINITY		168	40.00	219	201	7.00
NON-CARB HARD		190	62.00	119	46.19	7.00
LAB CONDUCTIVITY		1544	598	1438	805	7.00
FIELD COND.		1130	378	754	376	2.00
LAB pH			8.70	8.83	0.26	3.00
FIELD pH				0.00	0.00	0.00

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well #NCRP #23AB
Date Completed 5/25/75

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-2	2'	Topsoil
2'-7'	5'	Brown Sandy Clay
7'-19'	12'	Scoria
19'-20'	1	Coal Seam
20'-28'	8	Reddish Brown Silty Clay
28'-32'	4	Gray Clay
32'-38	6	Shale, Gray, Water at 38' all samples now saturated and therefore difficult to properly describe - approx. 10 gpm discharging from well due to air pressure.
38'-54'	16'	Light Brown to Gray Silty Shale grading into Higher silt %.
54'-60'	6'	Coal (and Shale) - sample may contain shale due to saturation of the hole - i. e., there is a problem getting good sample after going through so much wet shale. Less shale below 56'.
60'-82'	22'	Gray Siltstone, some gray mattrix.
82'-89'	7'	Hard Gray Sandstone. Took approx. 30 min. to cut through. Ruined one bit

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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#23AB continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
89'-101'	12'	Gray Sandy Silt
101'-102	1'	Dark Brown Shale
102'-107'	5'	Gray Sandy Silt
107'-132'	25'	Hard Gray Sandstone
132'-132.1'	.1'	Small Stringer of Coal
132.1'-140'	7.9'	Gray Sandstone
140'-170'	30'	No cuttings - lost circulation of cuttings but experienced no back-up on pressure gage.
170'-182'	12'	Circulation regained and we are in coal.
182'-190'	8'	Lost circulation. Regained circulation and now out of coal
190'-201'	11'	Gray Clay
201'-205'	4'	Sandstone
205'-210'	5'	Gray Clay

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DROPPED HEAD; BEGIN SECTIONS HERE
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9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP23A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4060

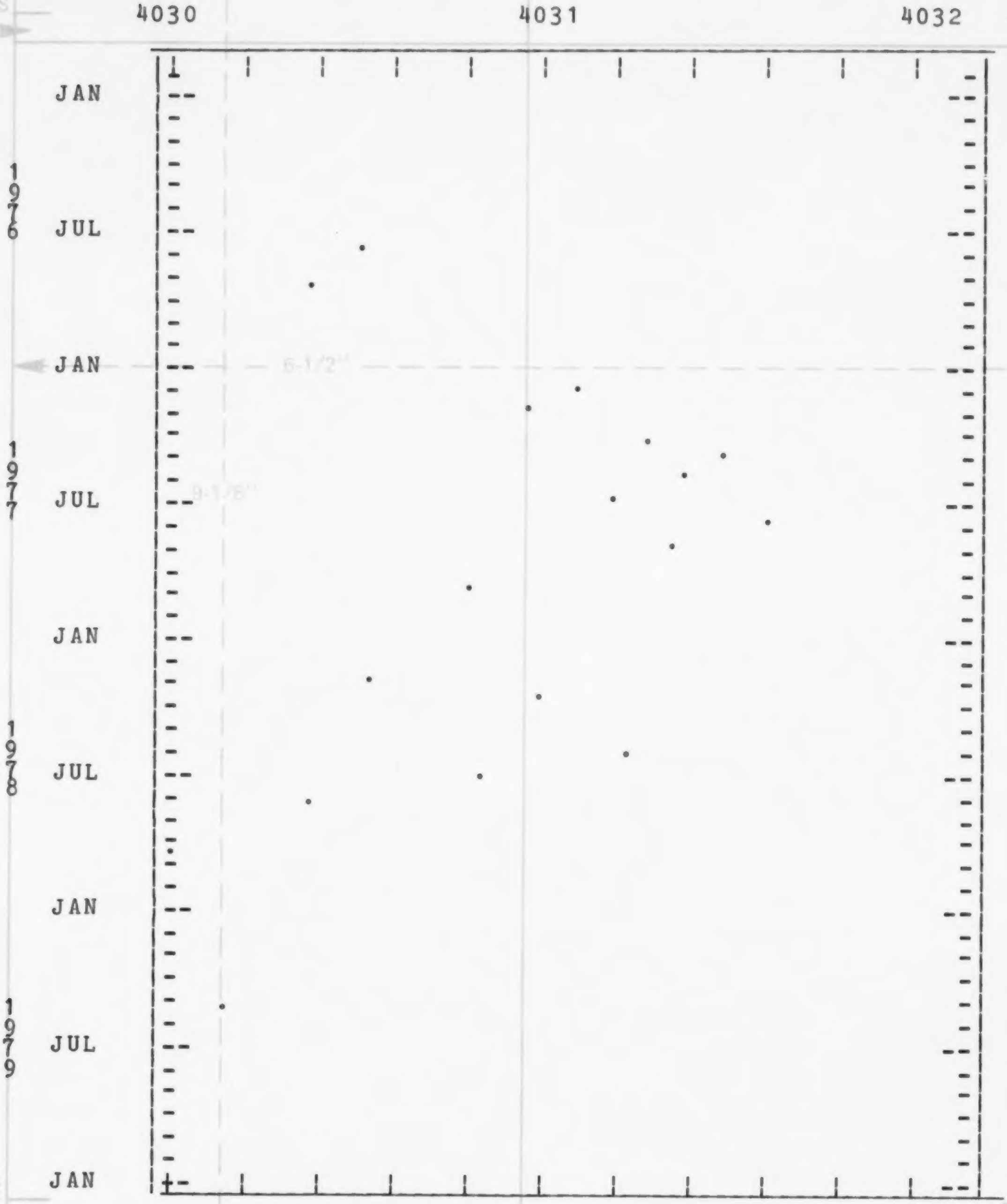
DATE	LEVEL	READING	CHANGE
6 8 1976	4039.43	20.57	00.00
6 24 1976	4032.28	27.72	07.15
7 27 1976	4030.48	29.52	01.80
9 1 1976	4029.50	30.50	00.98
9 13 1976	4030.35	29.65	-00.85
10 28 1976	4029.89	30.11	00.46
11 16 1976	4029.37	30.63	00.52
12 15 1976	4029.63	30.37	-00.26
1 31 1977	4031.02	28.98	-01.39
2 28 1977	4030.90	29.10	00.12
4 13 1977	4031.20	28.80	-00.30
4 28 1977	4031.39	28.61	-00.19
5 27 1977	4031.29	28.71	00.10
6 28 1977	4031.11	28.89	00.18
7 27 1977	4031.50	28.50	-00.39
8 30 1977	4031.26	28.74	00.24
10 27 1977	4030.75	29.25	00.51
12 12 1977	4029.88	30.12	00.87
1 18 1978	4032.32	27.68	-02.44
2 28 1978	4030.50	29.50	01.82
3 23 1978	4030.93	29.07	-00.43
6 6 1978	4031.15	28.85	-00.22
7 7 1978	4030.78	29.22	00.37
8 10 1978	4030.35	29.65	00.43
10 19 1978	4030.00	30.00	00.35
1 16 1979	4029.60	30.40	00.40
4 3 1979	4029.63	30.37	-00.03
5 16 1979	4030.14	29.86	-00.51
6 11 1979	4029.50	30.50	00.64
7 24 1979	4029.65	30.35	-00.15
8 16 1979	4029.84	30.16	-00.19
10 11 1979	4029.78	30.22	00.06

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP23A

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 23A 1 of 3

DATE		062476	091376	091376	121576	041377
POTASSIUM	PPM	10.00	10.00	10.00	9.00	6.00
SODIUM	PPM	79.00	660	60.00	56.00	70.00
CALCIUM	PPM	56.00	78.00	78.00	56.00	66.00
MAGNESIUM	PPM	42.00	32.00	32.00	46.00	39.00
SULFATE	PPM	143	128	128	112	137
CHLORIDE	PPM	5.00	9.00	9.00	4.00	66.00
CARBONATE	PPM	6.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	421	403	403	390	390
FLOURIDE	PPM	0.80	0.40	0.40	0.90	0.87
SILICON DIO	PPM	16.00	17.00	17.00	15.00	21.00
TOTAL P	PPM	0.05	0.08	0.08	0.04	0.38
NITRATE	PPM	1.00	2.00	2.00	1.00	0.80
POTASSIUM	EPM	0.26	0.26	0.26	0.23	0.15
SODIUM	EPM	3.44	28.71	2.61	2.44	3.05
CALCIUM	EPM	2.79	3.89	3.89	2.79	3.29
MAGNESIUM	EPM	3.45	2.63	2.63	3.78	3.21
SULFATE	EPM	2.98	2.66	2.66	2.33	2.85
CHLORIDE	EPM	0.14	0.25	0.25	0.11	1.86
CARBONATE	EPM	0.20	0.00	0.00	0.00	0.00
BICARBONATE	EPM	6.90	6.61	6.61	6.39	6.39
FLOURIDE	EPM	0.04	0.02	0.02	0.05	0.05
NITRATE	EPM	0.00	0.00	0.00	0.00	0.01
TOTAL CATIONS		9.94	35.49	9.39	9.24	9.70
TOTAL ANIONS		10.22	9.48	9.48	8.86	10.67
DEVIATION		103	26.71	101	95.79	110
TDS (calc.)		548	515	515	475	516
TDS @180		541	517	517	532	534
TOTAL HARDNESS		313	328	328	327	324
ALKALINITY		355	330	330	320	320
NON-CARB HARD		0.00	0.00	0.00	7.00	4.00
LAB CONDUCTIVITY		790	700	700	880	880
FIELD COND.						
LAB pH		8.20	8.40	8.40	7.80	7.70
FIELD pH		6.60	6.40	6.40	7.20	7.10

6-1/2''
9-1/8''
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 23A

2 of 3

DATE		062877	092077	121277
POTASSIUM	PPM	7.00	7.00	6.00
SODIUM	PPM	67.00	62.00	68.00
CALCIUM	PPM	49.00	60.00	50.00
MAGNESIUM	PPM	40.00	43.00	49.00
SULFATE	PPM	133	127	135
CHLORIDE	PPM	7.00	7.00	8.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	366	403	403
FLOURIDE	PPM	0.78	0.74	0.80
SILICON DIO	PPM	20.00	23.00	24.00
TOTAL P	PPM	0.25	0.02	0.01
NITRATE	PPM	3.50	1.00	3.80
POTASSIUM	EPM	0.18	0.18	0.15
SODIUM	EPM	2.91	2.70	2.96
CALCIUM	EPM	2.45	2.99	2.49
MAGNESIUM	EPM	3.29	3.54	4.03
SULFATE	EPM	2.77	2.64	2.81
CHLORIDE	EPM	0.20	0.20	0.23
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	6.00	6.61	6.61
FLOURIDE	EPM	0.04	0.04	0.04
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		8.83	9.41	9.64
TOTAL ANIONS		8.96	9.43	9.62
DEVIATION		101	100	99.87
TDS (calc.)		483	504	514
TDS @180		522	521	484
TOTAL HARDNESS		288	327	327
ALKALINITY		300	330	330
NON-CARB HARD		0.00	0.00	0.00
LAB CONDUCTIVITY		855	851	833
FIELD COND.			700	520
LAB pH		7.80	7.60	7.90
FIELD pH			7.35	7.20

EPA-287 (Cin.)
(4-76)

WELL NCRP 23A 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	8.13	1.69	8.00
SODIUM	PPM	140	197	8.00
CALCIUM	PPM	61.62	10.70	8.00
MAGNESIUM	PPM	40.37	5.68	8.00
SULFATE	PPM	130	8.60	8.00
CHLORIDE	PPM	14.37	19.58	8.00
CARBONATE	PPM	0.75	1.98	8.00
BICARBONATE	PPM	397	14.91	8.00
FLOURIDE	PPM	0.71	0.19	8.00
SILICON DIO	PPM	19.12	3.14	8.00
TOTAL P	PPM	0.11	0.13	8.00
NITRATE	PPM	1.64	1.45	8.00
POTASSIUM	EPM	0.21		
SODIUM	EPM	6.10		
CALCIUM	EPM	3.08		
MAGNESIUM	EPM	3.32		
SULFATE	EPM	2.71		
CHLORIDE	EPM	0.41		
CARBONATE	EPM	0.02		
BICARBONATE	EPM	6.51		
FLOURIDE	EPM	0.04		
NITRATE	EPM	0.00		
TOTAL CATIONS		12.70	8.62	8.00
TOTAL ANIONS		9.59	0.57	8.00
DEVIATION		92.24	25.05	8.00
TDS (calc.)		509	20.99	8.00
TDS @180		521	16.17	8.00
TOTAL HARDNESS		320	13.06	8.00
ALKALINITY		327	14.35	8.00
NON-CARB HARD		1.37	2.50	8.00
LAB CONDUCTIVITY		811	69.48	8.00
FIELD COND.		610	90.00	2.00
LAB pH		7.98	0.29	8.00
FIELD pH		6.89	0.38	7.00

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
1/2"
9-1/8"
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP23B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4060

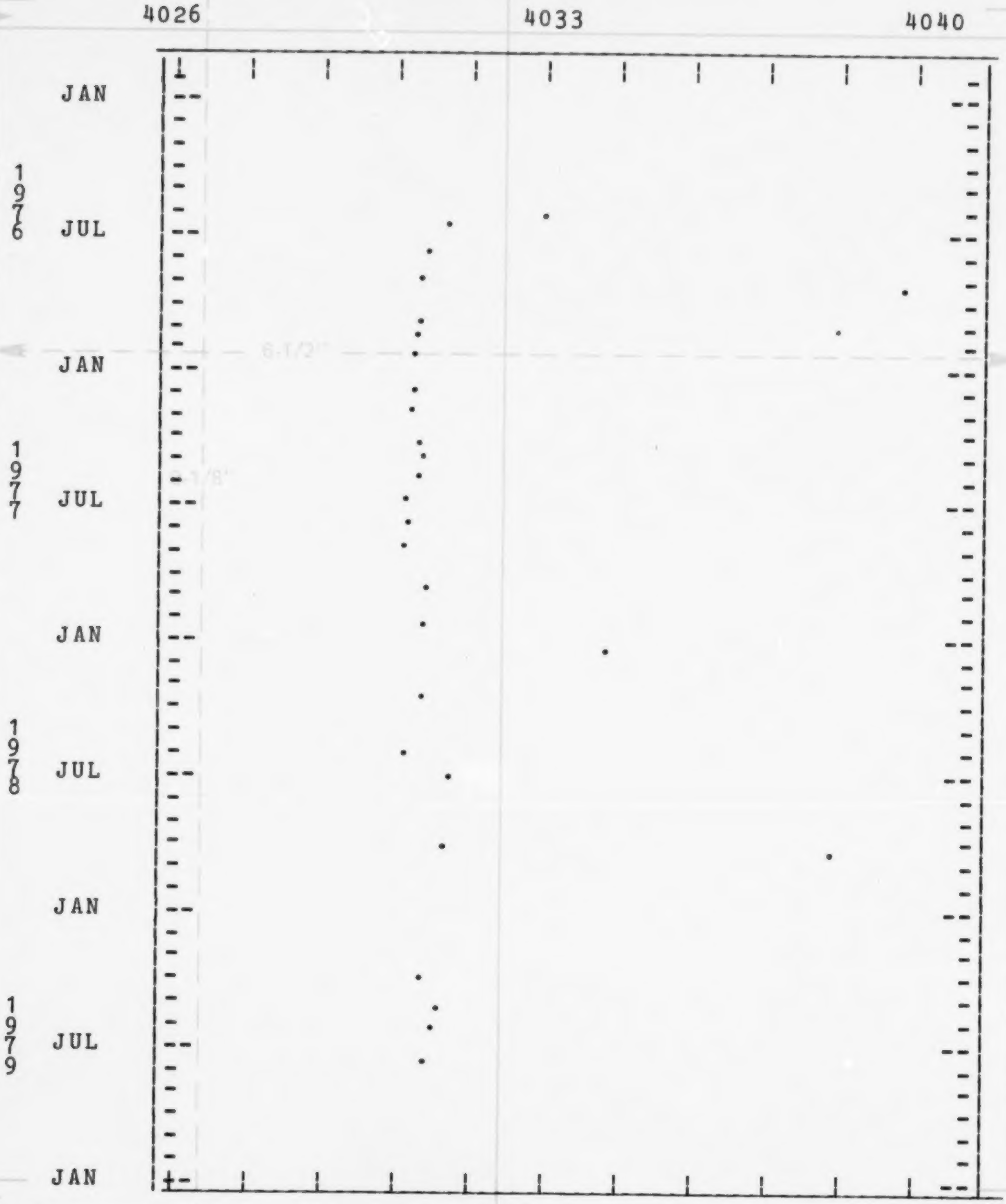
DATE	LEVEL	READING	CHANGE
6 8 1976	4032.51	27.49	00.00
6 24 1976	4030.81	29.19	01.70
7 27 1976	4030.48	29.52	00.33
9 1 1976	4030.34	29.66	00.14
9 13 1976	4038.88	21.12	-08.54
10 28 1976	4030.32	29.68	08.56
11 16 1976	4030.28	29.72	00.04
12 15 1976	4030.22	29.78	00.06
1 31 1977	4030.23	29.77	-00.01
2 28 1977	4030.20	29.80	00.03
4 13 1977	4030.32	29.68	-00.12
4 28 1977	4030.40	29.60	-00.08
5 27 1977	4030.33	29.67	00.07
6 28 1977	4030.10	29.90	00.23
7 27 1977	4030.13	29.87	-00.03
8 30 1977	4030.06	29.94	00.07
10 27 1977	4030.47	29.53	-00.41
12 12 1977	4030.42	29.58	00.05
1 18 1978	4033.64	26.36	-03.22
3 23 1978	4030.41	29.59	03.23
6 6 1978	4030.09	29.91	00.32
7 7 1978	4030.90	29.10	-00.81
10 10 1978	4030.76	29.24	00.14
10 19 1978	4037.62	22.38	-06.86
1 16 1979	4025.11	34.89	12.51
4 3 1979	4030.40	29.60	-05.29
5 16 1979	4030.70	29.30	-00.30
6 11 1979	4030.61	29.39	00.09
7 24 1979	4030.48	29.52	00.13
8 16 1979	4030.51	29.49	-00.03
10 11 1979	4030.50	29.50	00.01

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP23B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 23B   1 of 3

DATE		062476	072376	091376	121576	041277
POTASSIUM	PPM	15.00		17.00	10.00	7.00
SODIUM	PPM	55.00		60.00	60.00	71.00
CALCIUM	PPM	40.00		14.00	14.00	20.00
MAGNESIUM	PPM	21.00		7.00	8.00	7.00
SULFATE	PPM	160		144	153	151
CHLORIDE	PPM	5.00		9.00	5.00	5.00
CARBONATE	PPM	0.00		7.00	0.00	0.00
BICARBONATE	PPM	201		56.00	73.00	79.00
FLOURIDE	PPM	1.10		0.30	1.10	1.10
SILICON DIO	PPM	14.00		16.00	17.00	19.00
TOTAL P	PPM	0.07		0.02	0.03	0.02
NITRATE	PPM	1.00		1.00	1.00	0.05
POTASSIUM	EPM	0.38		0.43	0.26	0.18
SODIUM	EPM	2.39		2.61	2.61	3.09
CALCIUM	EPM	2.00		0.70	0.70	1.00
MAGNESIUM	EPM	1.73		0.58	0.66	0.58
SULFATE	EPM	3.33		3.00	3.19	3.14
CHLORIDE	EPM	0.14		0.25	0.14	0.14
CARBONATE	EPM	0.00		0.23	0.00	0.00
BICARBONATE	EPM	3.29		0.92	1.20	1.29
FLOURIDE	EPM	0.06		0.02	0.06	0.06
NITRATE	EPM	0.00		0.00	0.00	0.00
TOTAL CATIONS		6.50	201	4.32	4.22	4.84
TOTAL ANIONS		6.79	160	4.35	4.54	4.60
DEVIATION		104	79.57	101	108	95.03
TDS (calc.)		395		286	286	300
TDS @180		400		316	307	310
TOTAL HARDNESS		187		65.00	69.00	77.00
ALKALINITY		165		58.00	60.00	65.00
NON-CARB HARD		22.00		7.00	9.00	12.00
LAB CONDUCTIVITY		700		400	520	518
FIELD COND.						
LAB pH		8.10		9.30	8.00	8.00
FIELD pH		7.30	7.30	7.40	7.60	6.80

EPA-287 (Cin.)
(4-76)

WELL NCRP 23B 2 of 3

DATE		062877	092077	121277
POTASSIUM	PPM	8.00	7.00	10.00
SODIUM	PPM	73.00	72.00	75.00
CALCIUM	PPM	20.00	25.00	37.00
MAGNESIUM	PPM	8.00	13.00	36.00
SULFATE	PPM	166	168	172
CHLORIDE	PPM	6.00	6.00	6.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	92.00	131	281
FLOURIDE	PPM	1.10	0.84	0.74
SILICON DIO	PPM	18.00	17.00	16.00
TOTAL P	PPM	0.63	0.04	0.01
NITRATE	PPM	0.20	0.20	1.10
POTASSIUM	EPM	0.20	0.18	0.26
SODIUM	EPM	3.18	3.13	3.26
CALCIUM	EPM	1.00	1.25	1.85
MAGNESIUM	EPM	0.66	1.07	2.96
SULFATE	EPM	3.46	3.50	3.58
CHLORIDE	EPM	0.17	0.17	0.17
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	1.51	2.15	4.61
FLOURIDE	EPM	0.06	0.04	0.04
NITRATE	EPM	0.01	0.00	0.00
TOTAL CATIONS		5.04	5.63	8.33
TOTAL ANIONS		5.16	5.81	8.35
DEVIATION		102	103	100
TDS (calc.)		326	356	474
TDS @180		318	339	453
TOTAL HARDNESS		83.00	116	241
ALKALINITY		75.00	108	230
NON-CARB HARD		8.00	8.00	11.00
LAB CONDUCTIVITY		456	594	755
FIELD COND.			430	473
LAB pH		8.20	8.00	8.20
FIELD pH			8.40	7.83

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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9-1/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 23B 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	10.57	3.66	7.00
SODIUM	PPM	66.57	7.38	7.00
CALCIUM	PPM	24.29	9.69	7.00
MAGNESIUM	PPM	14.29	10.02	7.00
SULFATE	PPM	159	9.45	7.00
CHLORIDE	PPM	6.00	1.31	7.00
CARBONATE	PPM	1.00	2.45	7.00
BICARBONATE	PPM	130	76.17	7.00
FLOURIDE	PPM	0.90	0.28	7.00
SILICON DIO	PPM	16.71	1.48	7.00
TOTAL P	PPM	0.11	0.21	7.00
NITRATE	PPM	0.08	0.78	7.00
POTASSIUM	EPM	0.27		
SODIUM	EPM	2.90		
CALCIUM	EPM	1.21		
MAGNESIUM	EPM	1.18		
SULFATE	EPM	3.31		
CHLORIDE	EPM	0.17		
CARBONATE	EPM	0.03		
BICARBONATE	EPM	2.14		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		29.99	64.66	8.00
TOTAL ANIONS		24.95	51.05	8.00
DEVIATION		99.18	8.15	8.00
TDS (calc.)		346	63.92	7.00
TDS @180		349	51.90	7.00
TOTAL HARDNESS		120	63.23	7.00
ALKALINITY		109	60.79	7.00
NON-CARB HARD		11.00	4.78	7.00
LAB CONDUCTIVITY		563	119	7.00
FIELD COND.		451	21.50	2.00
LAB pH		8.26	0.43	7.00
FIELD pH		7.52	0.46	7.00

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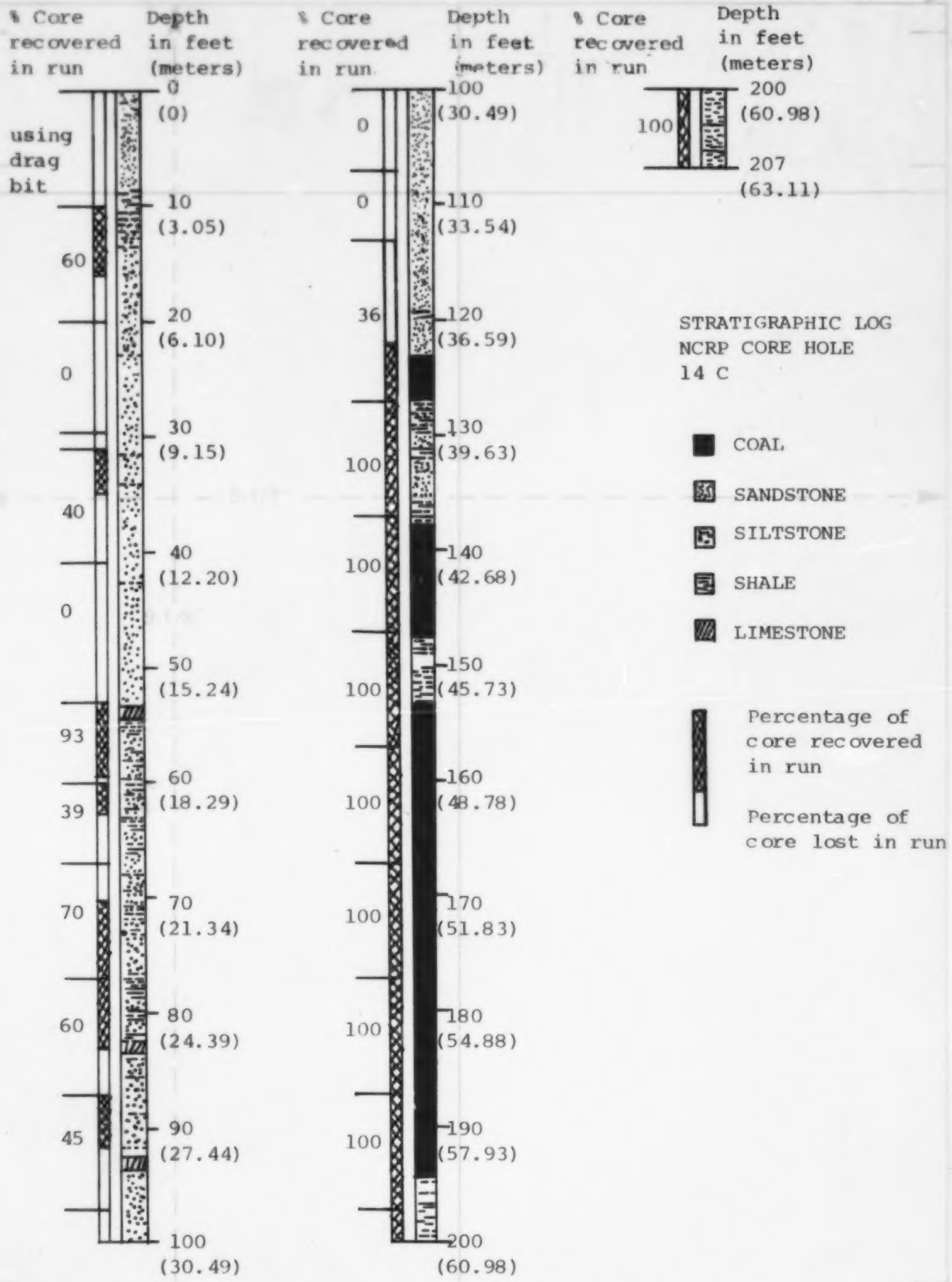


STRATIGRAPHIC LOG
NCRP CORE HOLE
14 C

% Core recovered in run
Depth in feet (meters)
0 (0)
using drag bit
10 (3.05)
60
20 (6.10)
0
30 (9.15)
40
40 (12.20)
0
50 (15.24)
93
60 (18.29)
39
70
70 (21.34)
60
80 (24.39)
45
90 (27.44)
100 (30.49)
% Core recovered in run
Depth in feet (meters)
100 (30.49)
0
110 (33.54)
0
36
120 (36.59)
130 (39.63)
100
140 (42.68)
100
150 (45.73)
100
160 (48.78)
100
170 (51.83)
100
180 (54.88)
100
190 (57.93)
100
200 (60.98)
% Core recovered in run
Depth in feet (meters)
200 (60.98)
100
207 (63.11)
COAL
SANDSTONE
SILTSTONE
SHALE
LIMESTONE
Percentage of core recovered in run
Percentage of core lost in run

1 of 1

WELL NCRP14C

GROUNDWATER LEVELS (FEET--DATUM MSL)

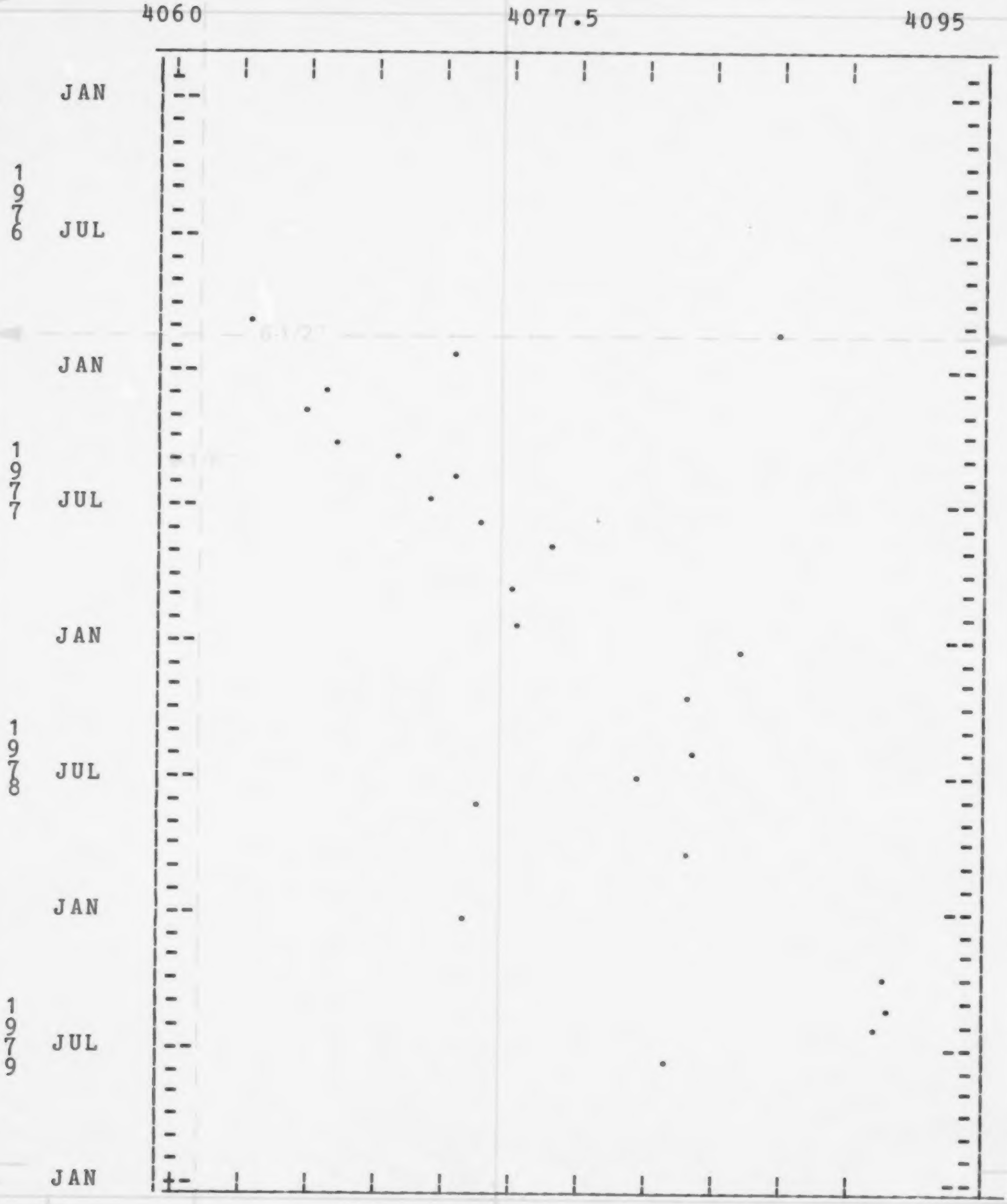
elevation at top of well casing is 4200

DATE	LEVEL	READING	CHANGE
10 28 1976	4063.75	136.25	00.00
11 16 1976	4089.06	110.94	-25.31
12 15 1976	4073.52	126.48	15.54
1 31 1977	4067.36	132.64	06.16
2 28 1977	4066.40	133.60	00.96
4 13 1977	4067.85	132.15	-01.45
4 28 1977	4070.71	129.29	-02.86
5 27 1977	4073.60	126.40	-02.89
6 28 1977	4072.40	127.60	01.20
7 27 1977	4074.78	125.22	-02.38
8 30 1977	4078.21	121.79	-03.43
10 27 1977	4076.32	123.68	01.89
12 12 1977	4076.60	123.40	-00.28
1 18 1978	4087.34	112.66	-10.74
3 23 1978	4084.77	115.23	02.57
6 6 1978	4085.05	114.95	-00.28
7 7 1978	4082.38	117.62	02.67
8 10 1978	4074.66	125.34	07.72
10 19 1978	4084.77	115.23	-10.11
1 16 1979	4074.02	125.98	10.75
4 3 1979	4094.26	105.74	-20.24
5 16 1979	4094.37	105.63	-00.11
6 11 1979	4093.80	106.20	00.57
7 24 1979	4083.70	116.30	10.10
8 16 1979	4078.84	121.16	04.86
10 11 1979	4053.90	146.10	24.94

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP14C

WATER LEVEL (FEET ABOVE MSL)



EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
BEGIN FIRST LINE OF TEXT HERE
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG

Well NCRP #4
Date Completed 5/14/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0-1'	1'	Black Top Soil
1-4'	3'	Yellow Clay
4-18'	14'	Yellow Sand
18-20	2'	Red Sandstone
20-23	3'	Gray Shale
23-26	3'	Gray Sandstone
26-30	4'	Yellow Sandstone
30-36	6'	Gray Sandstone & Clay
36'39	3'	Brown Sandstone & Clay
39-41	2'	Gray Shale
41-42	1'	Dark Gray Shale
42-44	2'	Coal
44-51	7'	Gray Shale
51-56	5'	Light Gray Shale
56-59	3'	Gray Shale
59-71	12'	Coal
71-74	3'	Gray Sandstone
74-77	3'	Gray Shale
77-78.5	1.5'	Sandstone

BEGIN LAST LINE OF TEXT
3/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#4 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
78.5-91	12.5'	Gray Shale, Sandy
91-91.5	0.5'	Coal
91.5-112	20.5'	Gray Shale & Sandy
112-113	1'	Hard Gray Shale
113-130	17'	Gray Shale, Sandy
130-132	2'	Coal
132-140	8'	Gray Sandstone and Clay
140-146	6'	Coal
146-149	3'	Gray Shale
149-172	23'	Dark Gray Sandstone & Sand
172-238	66'	Light Gray Sandstone
238-239	1'	Coal
239-248	9'	Light Gray Sandstone
248-248.5	0.5'	Coal
248.5-253	4.5'	Brown Sandstone
253-260	7'	Coal
260-269	9'	Brown Sandstone
269-270	1'	Light Gray Hard Sandstone
270-296	26'	Darker Gray Sandstone
296-298	2'	Hard Sandstone
298-332	34'	Light Gray Sandstone

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

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TYPING GUIDE SHEET

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TOP OF IMAGE AREA

#4 continued

DROPPED HEAD; BEGIN SECTIONS HERE

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
332-392	60'	Coal (H_2O)
392-394	2'	Shale

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP4

GROUNDWATER LEVELS (FEET--DATUM MSL)

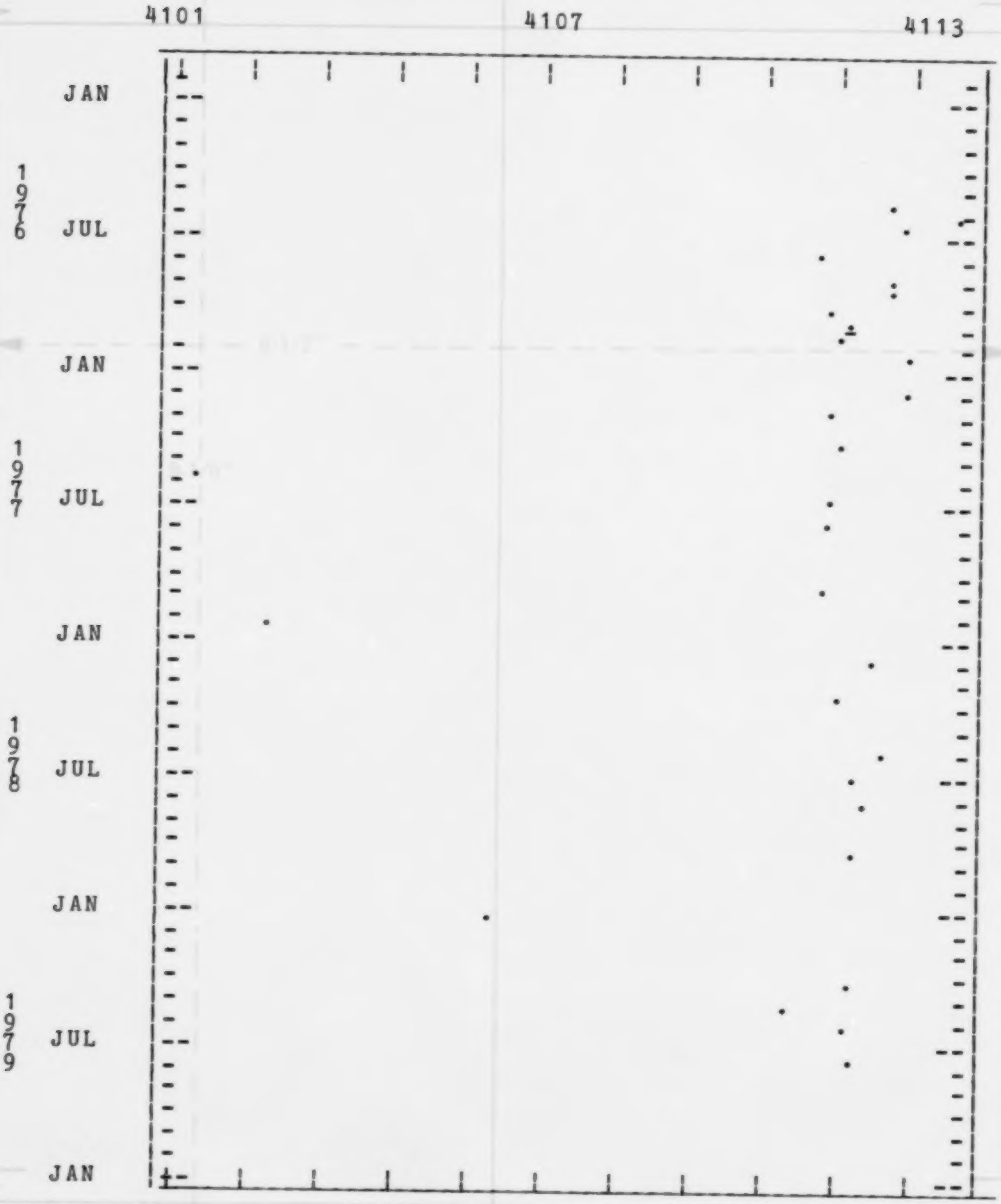
elevation at top of well casing is 4385

DATE	LEVEL	READING	CHANGE
5 20 1976	4111.87	273.13	00.00
6 8 1976	4112.89	272.11	-01.02
6 24 1976	4112.07	272.93	00.82
7 27 1976	4110.79	274.21	01.28
9 1 1976	4111.90	273.10	-01.11
9 13 1976	4111.90	273.10	00.00
10 12 1976	4110.95	274.05	00.95
10 28 1976	4111.25	273.75	-00.30
11 16 1976	4111.10	273.90	00.15
12 15 1976	4112.14	272.86	-01.04
1 31 1977	4112.13	272.87	00.01
2 28 1977	4110.96	274.04	01.17
4 14 1977	4111.12	273.88	-00.16
4 28 1977	4100.92	284.08	10.20
5 27 1977	4101.34	283.66	-00.42
6 28 1977	4110.96	274.04	-09.62
7 28 1977	4110.93	274.07	00.03
10 27 1977	4110.85	274.15	00.08
12 12 1977	4102.42	282.58	08.43
2 2 1978	4111.62	273.38	-09.20
3 23 1978	4111.10	273.90	00.52
6 6 1978	4111.78	273.22	-00.68
7 7 1978	4111.32	273.68	00.46
8 10 1978	4111.50	273.50	-00.18
10 19 1978	4111.32	273.68	00.18
1 16 1979	4105.84	279.16	05.48
4 13 1979	4111.31	273.69	-05.47
5 16 1979	4110.36	274.64	00.95
6 11 1979	4111.25	273.75	-00.89
7 24 1979	4111.36	273.64	-00.11
8 16 1979	4111.33	273.67	00.03
10 11 1979	4111.25	273.75	00.08

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP4

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
(4-76)

WELL NCRP 4 (CANYON COAL AQUIFER) 1 of 3

DATE		062476	101276	121676	041477	041177
POTASSIUM	PPM	15.00	15.00	12.00	10.00	13.00
SODIUM	PPM	295	215	168	200	200
CALCIUM	PPM	83.00	274	276	156	228
MAGNESIUM	PPM	87.00	11.00	4.00	82.00	38.00
SULFATE	PPM	640	541	528	527	532
CHLORIDE	PPM	6.00	13.00	8.00	9.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	708	750	689	744	769
FLOURIDE	PPM	0.40	0.28	0.40	0.26	0.24
SILICON DIO	PPM	13.00	14.00	13.00	16.00	17.00
TOTAL P	PPM	0.07	0.05	0.05	0.31	0.22
NITRATE	PPM	1.00	1.00	2.00	0.10	0.10
POTASSIUM	EPM	0.38	0.38	0.31	0.26	0.33
SODIUM	EPM	12.83	9.35	7.31	8.70	8.70
CALCIUM	EPM	4.14	13.67	13.77	7.78	11.38
MAGNESIUM	EPM	7.16	0.90	0.33	6.75	3.13
SULFATE	EPM	13.32	11.26	10.99	10.97	11.08
CHLORIDE	EPM	0.17	0.37	0.23	0.25	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	11.60	12.29	11.29	12.19	12.60
FLOURIDE	EPM	0.02	0.01	0.02	0.01	0.01
NITRATE	EPM	0.00	0.00	0.00	0.01	0.00
TOTAL CATIONS		24.51	24.31	21.72	23.49	23.54
TOTAL ANIONS		25.08	23.84	22.47	23.37	23.90
DEVIATION		102	98.06	103	99.52	102
TDS (calc.)		1474	1439	1335	1351	1400
TDS @180		1527	1447	1374	1339	1385
TOTAL HARDNESS		566	728	703	726	722
ALKALINITY		580	615	565	610	630
NON-CARB HARD		0.00	113	138	116	92.00
LAB CONDUCTIVITY		2000	2000	2000	1995	1900
FIELD COND.						
LAB pH		8.00	7.50	7.60	7.60	7.40
FIELD pH		6.70	6.40	6.90	7.00	6.40

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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WELL NCRP 4 (CANYON COAL AQUIFER) 2 of 3

DATE		062877	091977	121277
POTASSIUM	PPM	14.00	20.00	12.00
SODIUM	PPM	180	220	242
CALCIUM	PPM	39.00	82.00	1117
MAGNESIUM	PPM	97.00	93.00	103
SULFATE	PPM	533	534	568
CHLORIDE	PPM	11.00	10.00	9.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	415	683	817
FLOURIDE	PPM	0.25	0.26	0.38
SILICON DIO	PPM	18.00	16.00	17.00
TOTAL P	PPM	0.50	0.04	0.01
NITRATE	PPM	0.10	0.10	0.30
POTASSIUM	EPM	0.36	0.51	0.31
SODIUM	EPM	7.83	9.57	10.53
CALCIUM	EPM	1.95	4.09	55.74
MAGNESIUM	EPM	7.98	7.65	8.47
SULFATE	EPM	11.10	11.12	11.83
CHLORIDE	EPM	0.31	0.28	0.25
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	6.80	11.19	13.39
FLOURIDE	EPM	0.01	0.01	0.02
NITRATE	EPM	0.01	0.00	0.00
TOTAL CATIONS		18.11	21.82	75.04
TOTAL ANIONS		18.15	22.53	25.42
DEVIATION		100	103	33.88
TDS (calc.)		1078	1295	1454
TDS @180		1271	1355	1504
TOTAL HARDNESS		496	587	712
ALKALINITY		340	560	670
NON-CARB HARD		156	27.00	42.00
LAB CONDUCTIVITY		1900	1979	2107
FIELD COND.				1420
LAB pH		7.50	7.70	7.50
FIELD pH			7.10	7.24

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
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WELL NCRP 4 (CANYON COAL AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	13.87	2.80	8.00
SODIUM	PPM	215	37.14	8.00
CALCIUM	PPM	282	327	8.00
MAGNESIUM	PPM	64.37	37.73	8.00
SULFATE	PPM	550	36.03	8.00
CHLORIDE	PPM	9.50	1.94	8.00
CARBONATE	PPM	0.00	0.00	8.00
BICARBONATE	PPM	697	114	8.00
FLOURIDE	PPM	0.31	0.07	8.00
SILICON DIO	PPM	15.50	1.80	8.00
TOTAL P	PPM	0.15	0.16	8.00
NITRATE	PPM	0.04	0.87	8.00
POTASSIUM	EPM	0.35		
SODIUM	EPM	9.35		
CALCIUM	EPM	14.07		
MAGNESIUM	EPM	5.30		
SULFATE	EPM	11.46		
CHLORIDE	EPM	0.27		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	11.42		
FLOURIDE	EPM	0.02		
NITRATE	EPM	0.00		
TOTAL CATIONS		29.07	17.48	8.00
TOTAL ANIONS		23.10	2.12	8.00
DEVIATION		92.78	22.33	8.00
TDS (calc.)		1353	119	8.00
TDS @180		1400	80.96	8.00
TOTAL HARDNESS		655	85.32	8.00
ALKALINITY		571	93.77	8.00
NON-CARB HARD		85.50	52.54	8.00
LAB CONDUCTIVITY		1985	61.40	8.00
FIELD COND.		1420	0.00	1.00
LAB pH		7.60	0.17	8.00
FIELD pH		6.82	0.31	7.00

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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LITHOLOGIC LOG

Well: NCRP #19
Date Completed: 4/15/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-8'	8'	Sandstone, Medium Fine, Red, Burned
8'-83'	75'	Clinker (Burned shale and sandstone). Brick Red. Lost cuttings 25'-40' because formation absorbed air. Steel casing put down to 68' due to additional air loss
83'-86'	3'	Shale, Dark Gray to Brown
86'-87'	1'	Shale, Hard, Rusty Brown
87'-91'	4'	Shale, Dark gray, Fissile, Silt
91'-92'	1'	Shale, Hard, Rusty Brown
92'-94'	2'	Shale, Gray
94'-99'	5'	Coal, 2 gal. H_2O per minute
99'-103'	4'	Shale, Gray, Silty
103'-120'	17'	Siltstone, Light Gray
120'-123'	3'	Hard Layer
123'-127'	4'	Sandstone, Gray, Fine
127'-138'	11'	Shale, Dark Gray
138'-139'	1'	Coal, Small Flow H_2O
139'-143'	4'	Shale, Gray

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

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EPA-287 (Cin.)
(4-76)

#19 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
143'-158'	15'	Shale, Gray, Softer, Silty
158'-167'	9'	Sandstone, Gray
167'-167.5'	.5'	Hard Layer
167.5'-177'	9.5'	Sandstone, Gray? - From 120' on, water in hole has caused cuttings to cake up sides of hole. Few cuttings reached surface and those that do are muddy. From this depth only lithlologies are more guess work H_2O in this layer
177'-177.5'	.5'	Hard Layer - Tan Sandstone?
177.5'-185'	7.5'	Shale, Gray? At 180' drillers pulled up pipes to clean walls
185'-193'	8'	Shale, Sandstone, Some coal in cuttings?
193'-200'	7'+	Shale, Gray core solid Formation, Wet cuttings, Water injected (177'-200')
200'-220'	20'	At 200' drillers pulled up pipe to cleam walls. No cuttins Material started caving in just below casing and blocking hole. Drillers couldn't get past 78' where there was a cave-in. The steel casing was left in hole. Water 76'-78'

LITHOLOGIC LOG

Well # NCRP #22
Date Completed 5/19/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-3'	3'	Topsoil
3'-4'	1'	Brown Sandstone
4'-10'	6'	Black Shale
10'-14'	4'	Gray Shale
14'-16'	2'	Brown Shale
16'-20.5'	4.5'	Gray Clay and Sand
20.5'-22'	1.5'	Coal
22'-25'	3'	Gray Shale
25'-29'	4'	Brown Sand
29'-32'	3'	Reddish Brown Sand
32'-33'	1'	Gray Shale
33'-39'	6'	Coal
39'-54'	15'	Gray Sand and Shale
45'-68'	14'	Gray Shale
68'-68.5'	.5'	Hard Sandstone-very hard
68.5'-75'	6.5'	Gray Shale and Clay
75'-76'	1'	Dark Gray Shale
76'-90'	14'	Gray Shale and Clay
90'-90.1'	.1'	Hard Sandstone Stringer

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
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3-1/8"

#22 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
90.1'-107'	16.9'	Gray Shale and Clay, Hard Sandstone
107'-117'	10'	Gray Shale and Clay
117'-117.5'	.5'	Brown Layer
117.5'-121'	3.5'	Gray Shale and Clay
121'-121.2'	.2'	Hard Sandstone
121.2'-125'	3.8'	Gray Sand
125'-130'	5'	Darker Gray Sand
130'-158'	28'	Darker Gray Sand
158'-175	17'	Gray Shale and Sand
175'-181	6'	Darker Gray Shale and Sand
181'-186'	5'	Darker Red, Gray Shale and Sand
186'-226	40'	Gray Shale and Sand
226'-268'	42'	Coal
268'-272'	4'	Gray Shale Very Fast Drilling, Approx. 5 FPM

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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EPA-287 (Cin.)
(4-76)

WELL NCRP22

GROUNDWATER LEVELS (FEET--DATUM MSL)

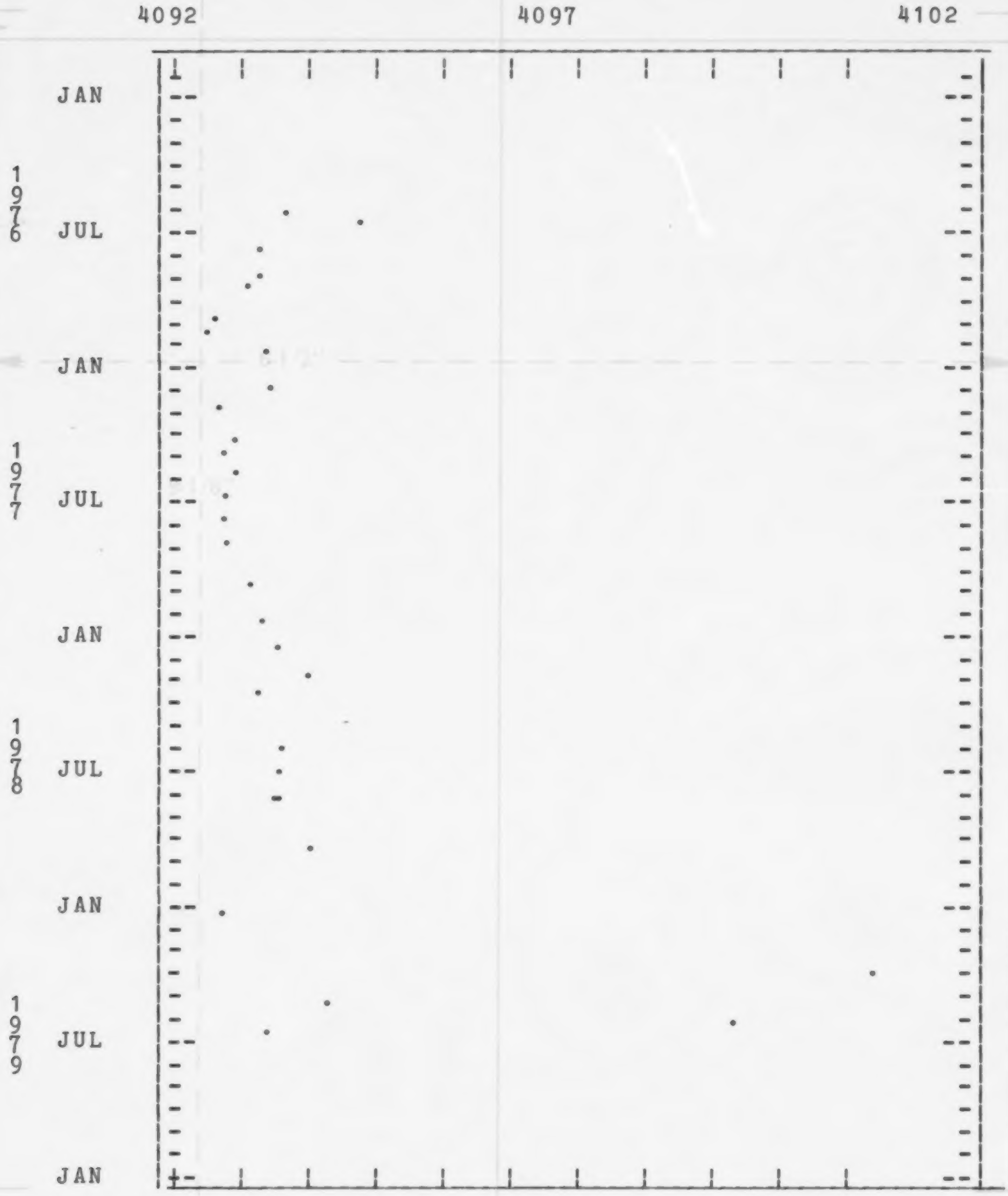
elevation at top of well casing is 4279

DATE	LEVEL	READING	CHANGE
6 8 1976	4093.55	185.45	00.00
6 24 1976	4094.58	184.42	-01.03
7 27 1976	4093.19	185.81	01.39
9 1 1976	4093.20	185.80	-00.01
9 13 1976	4093.02	185.98	00.18
10 28 1976	4092.57	186.43	00.45
11 16 1976	4092.44	186.56	00.13
12 15 1976	4093.29	185.71	-00.85
1 31 1977	4093.32	185.68	-00.03
2 28 1977	4092.62	186.38	00.70
4 14 1977	4092.84	186.16	-00.22
4 28 1977	4092.70	186.30	00.14
5 27 1977	4092.86	186.14	-00.16
6 28 1977	4092.72	186.28	00.14
7 27 1977	4092.70	186.30	00.02
8 30 1977	4092.73	186.27	-00.03
10 27 1977	4093.06	185.94	-00.33
12 12 1977	4093.23	185.77	-00.17
1 18 1978	4093.44	185.56	-00.21
2 28 1978	4093.87	185.13	-00.43
3 23 1978	4093.17	185.83	00.70
6 6 1978	4093.50	185.50	-00.33
7 7 1978	4093.47	185.53	00.03
8 10 1978	4093.47	185.53	00.00
8 10 1978	4093.41	185.59	00.06
10 19 1978	4093.90	185.10	-00.49
1 16 1979	4092.66	186.34	01.24
4 3 1979	4101.66	177.34	-09.00
5 16 1979	4094.13	184.87	07.53
6 11 1979	4099.74	179.26	-05.61
6 24 1979	4093.30	185.70	06.44
8 16 1979	4094.45	184.55	-01.15
10 11 1979	4094.50	184.50	-00.05

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP22

WATER LEVEL (FEET ABOVE MSL)



EPA-287 (Cin.)
(4-76)

WELL NCRP 22 (CANYON COAL AQUIFER) 1 of 2

DATE		062476	091376	121576	062877	092077
POTASSIUM	PPM	15.00	10.00	10.00	7.00	14.00
SODIUM	PPM	767	754	735	700	720
CALCIUM	PPM	18.00	20.00	12.00	12.00	10.00
MAGNESIUM	PPM	17.00	2.00	5.00	4.00	6.00
SULFATE	PPM	717	637	640	649	617
CHLORIDE	PPM	15.00	13.00	17.00	11.00	13.00
CARBONATE	PPM	84.00	132	216	36.00	0.00
BICARBONATE	PPM	1019	952	756	1061	1220
FLOURIDE	PPM	0.90	0.80	0.90	0.79	0.80
SILICON DIO	PPM	13.00	10.00	13.00	11.00	12.00
TOTAL P	PPM	0.07	0.03	1.00	0.04	0.08
NITRATE	PPM	1.00	1.00	0.03	0.50	0.60
POTASSIUM	EPM	0.38	0.26	0.26	0.18	0.36
SODIUM	EPM	33.36	32.80	31.97	30.45	31.32
CALCIUM	EPM	0.90	1.00	0.60	0.60	0.50
MAGNESIUM	EPM	1.40	0.16	0.41	0.33	0.49
SULFATE	EPM	14.93	13.26	13.32	13.51	12.85
CHLORIDE	EPM	0.42	0.37	0.48	0.31	0.37
CARBONATE	EPM	2.80	4.40	7.20	1.20	0.00
BICARBONATE	EPM	16.70	15.60	12.39	17.39	20.00
FLOURIDE	EPM	0.05	0.04	0.05	0.04	0.04
NITRATE	EPM	0.00	0.00	0.02	0.00	0.00
TOTAL CATIONS		36.04	34.22	33.24	31.56	32.67
TOTAL ANIONS		34.79	33.58	33.30	32.37	33.16
DEVIATION		96.52	98.13	100	103	101
TDS (calc.)		2135	2037	2008	1942	1981
TDS @180		2076	1985	2004	1970	1931
TOTAL HARDNESS		113	60.00	50.00	44.00	48.00
ALKALINITY		975	1000	980	930	1000
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		3000	2500	3100	3040	2970
FIELD COND.						2250
LAB pH		8.60	9.20	8.30	8.30	8.20
FIELD pH		7.30	7.40	8.00		8.00

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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WELL NCRP 22 (CANYON COAL AQUIFER) 2 of 2

DATE		091977	121277	MEAN	ST.DEV	#
POTASSIUM	PPM		7.00	10.50	3.10	6.00
SODIUM	PPM		674	725	31.51	6.00
CALCIUM	PPM		16.00	14.67	3.59	6.00
MAGNESIUM	PPM		5.00	6.50	4.86	6.00
SULFATE	PPM		574	639	42.62	6.00
CHLORIDE	PPM		9.00	13.00	2.58	6.00
CARBONATE	PPM		30.00	83.00	73.03	6.00
BICARBONATE	PPM		1037	1007	139	6.00
FLOURIDE	PPM		1.40	0.93	0.21	6.00
SILICON DIO	PPM		12.00	11.83	1.07	6.00
TOTAL P	PPM		0.02	0.13	0.39	6.00
NITRATE	PPM		1.30	0.07	0.84	6.00
POTASSIUM	EPM		0.18	0.27		
SODIUM	EPM		29.32	31.54		
CALCIUM	EPM		0.80	0.73		
MAGNESIUM	EPM		0.41	0.53		
SULFATE	EPM		11.95	13.30		
CHLORIDE	EPM		0.25	0.37		
CARBONATE	EPM		1.00	2.77		
BICARBONATE	EPM		17.00	16.51		
FLOURIDE	EPM		0.07	0.05		
NITRATE	EPM		0.00	0.00		
TOTAL CATIONS		201	30.71	57.07	58.79	7.00
TOTAL ANIONS		160	30.21	51.05	44.48	7.00
DEVIATION		79.57	98.37	96.69	7.25	7.00
TDS (calc.)			1826	1988	93.81	6.00
TDS @180			1810	1963	81.04	6.00
TOTAL HARDNESS			58.00	62.17	23.40	6.00
ALKALINITY			900	964	37.01	6.00
NON-CARB HARD			0.00	0.00	0.00	6.00
LAB CONDUCTIVITY			2744	2892	208	6.00
FIELD COND.		2250	1730	2077	245	3.00
LAB pH			8.50	8.52	0.33	6.00
FIELD pH		8.00	7.82	7.75	0.29	6.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #24
Date Completed 5/27/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-4'	4'	Red Shale
4'-16'	12'	Gray Shale
16'-20'	4'	Brown Sand, Very Fast Drilling, approx. 10 FPM
20'-39'	19'	Scoria
39'042'	3'	Brown Sand
42'-45'	3'	Dark Brown Sand
45'-66'	21'	Lighter Brown Sand and Scoria
66'-68'	2'	Hard Layer of Sandstone Hard Drilling, Reddish Brown
68'-75'	7'	Light Brown Sand and Shale Sample #70 may contain some contamination as we had difficulty drilling.
75'-78'	3'	Red Shale or Sandstone
78'-78.5'	.5'	Light Brown Shale
78.5'-80'	1.5'	Red Sandstone
80'-82'	2'	Hard Red Sandstone (Hard Drilling)
82'-85'	3'	Red Shale Chips and Sand
85'-90'	5'	Brown Shale Chips and Sand

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#24 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
90'-96'	6'	Red Sandstone, Chips possibly Scoria
96'-102'	6'	Red (Really Red) Shale at 100 ft. We are having a difficult time drilling. We pumped water down the hole and the cuttings are dry when they arrive at the surface. They are about the size of pea gravel.
102'-120'	18'	Red Shale and Sand
120'-130'	10'	Red Gritty Sand and Small Pellets
130'-144'	14'	Coarse Red Sand
144'-145'	1'	Hard Red Sandstone (Hard Drilling)
145'-160'	15'	Coarse Red Sand
160'-176'	16'	Gray Mud and Chips
176'-196'	20'	Coal
196'-197'	1'	Hard Sandstone (Hard Drilling)
197'-208'	11'	Broken Sandstone-Seam Harder Sandstone
208'-220'	12'	Gray Shale

1 of 1

WELL NCRP24

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4171

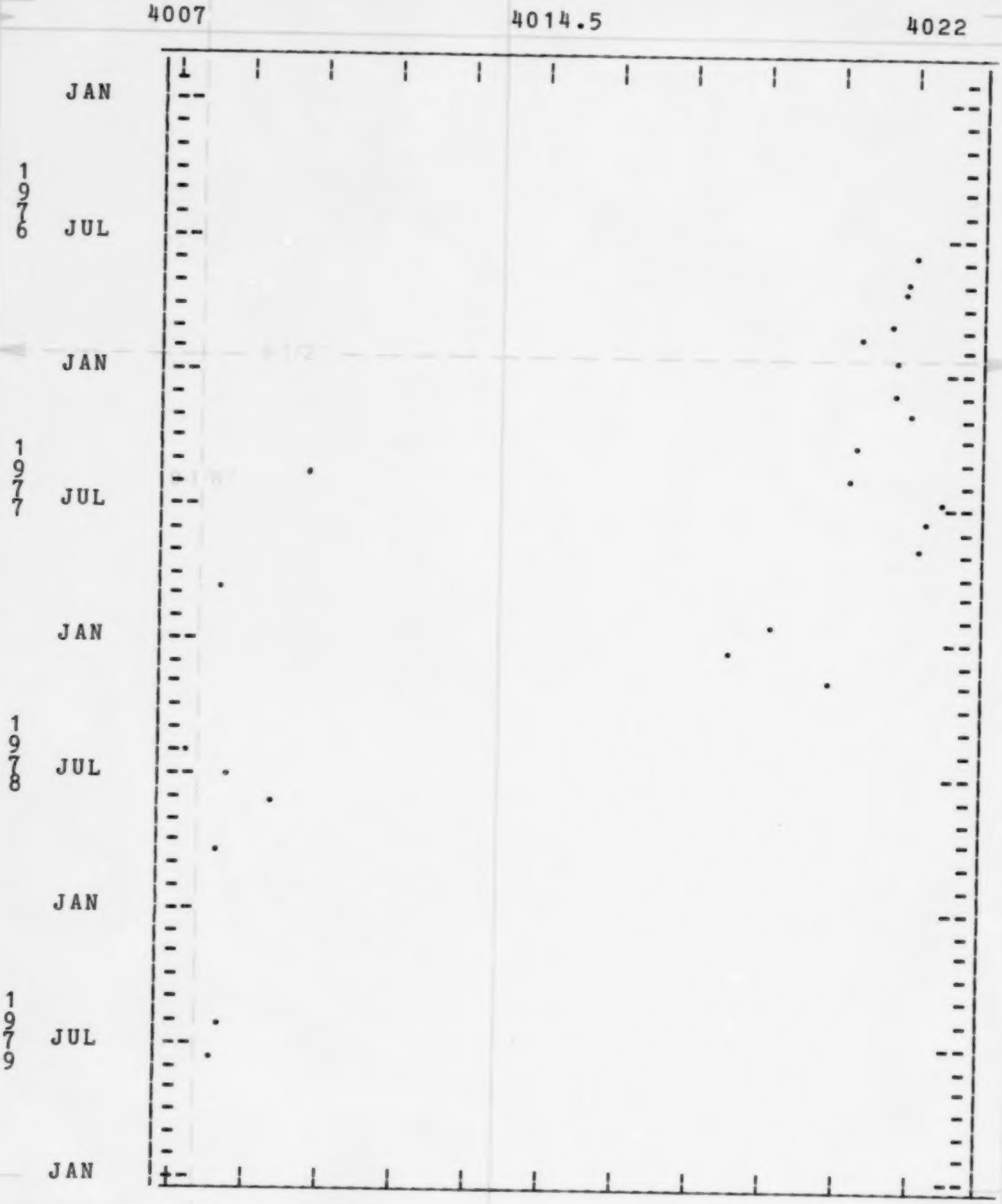
DATE	LEVEL	READING	CHANGE
6 8 1976	4022.88	148.12	00.00
7 27 1976	4021.04	149.96	01.84
9 1 1976	4020.90	150.10	00.14
9 13 1976	4020.81	150.19	00.09
10 28 1976	4020.58	150.42	00.23
11 16 1976	4020.00	151.00	00.58
12 16 1976	4020.68	150.32	-00.68
1 31 1977	4020.66	150.34	00.02
2 28 1977	4020.96	150.04	-00.30
4 13 1977	4019.91	151.09	01.05
5 27 1977	4019.82	151.18	00.09
6 28 1977	4021.56	149.44	-01.74
7 26 1977	4021.26	149.74	00.30
8 30 1977	4021.12	149.88	00.14
10 27 1977	4007.88	163.12	13.24
12 12 1977	4018.34	152.66	-10.46
1 18 1978	4017.53	153.47	00.81
2 28 1978	4019.45	151.55	-01.92
6 6 1978	4007.26	163.74	12.19
7 7 1978	4008.04	162.96	-00.78
8 10 1978	4008.90	162.10	-00.86
10 19 1978	4007.85	163.15	01.05
6 11 1979	4007.93	163.07	-00.08
7 24 1979	4007.79	163.21	00.14
8 16 1979	4007.80	163.20	-00.01

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP24

WATER LEVEL (FEET ABOVE MSL)



PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 24 (CANYON COAL AQUIFER) 1 of 2

DATE		062476	091376	121676	041377	062877
POTASSIUM	PPM	15.00	20.00	11.00	12.00	14.00
SODIUM	PPM	107	110	87.00	110	110
CALCIUM	PPM	46.00	66.00	52.00	68.00	35.00
MAGNESIUM	PPM	42.00	30.00	37.00	27.00	39.00
SULFATE	PPM	119	108	83.00	109	119
CHLORIDE	PPM	4.00	8.00	4.00	5.00	4.00
CARBONATE	PPM	6.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	488	512	488	488	488
FLOURIDE	PPM	0.90	0.90	1.00	0.94	1.10
SILICON DIO	PPM	9.00	21.00	20.00	28.00	41.00
TOTAL P	PPM	0.10	0.04	0.10	0.08	0.94
NITRATE	PPM	3.00	2.00	2.00	2.00	2.10
POTASSIUM	EPM	0.38	0.51	0.28	0.31	0.36
SODIUM	EPM	4.65	4.78	3.78	4.78	4.78
CALCIUM	EPM	2.30	3.29	2.59	3.39	1.75
MAGNESIUM	EPM	3.45	2.47	3.04	2.22	3.21
SULFATE	EPM	2.48	2.25	1.73	2.27	2.48
CHLORIDE	EPM	0.11	0.23	0.11	0.14	0.11
CARBONATE	EPM	0.20	0.00	0.00	0.00	0.00
BICARBONATE	EPM	8.00	8.39	8.00	8.00	8.00
FLOURIDE	EPM	0.05	0.05	0.05	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.02
TOTAL CATIONS		10.79	11.06	9.70	10.71	10.10
TOTAL ANIONS		10.81	10.85	9.86	10.42	10.63
DEVIATION		100	98.17	102	97.35	105
TDS (calc.)		579	594	514	571	561
TDS @180		592	574	633	562	606
TOTAL HARDNESS		288	288	283	281	249
ALKALINITY		410	420	400	400	400
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		900	850	925	968	959
FIELD COND.						
LAB pH		8.20	8.20	7.80	7.70	7.70
FIELD pH		7.00	6.40	6.80	7.10	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUS TRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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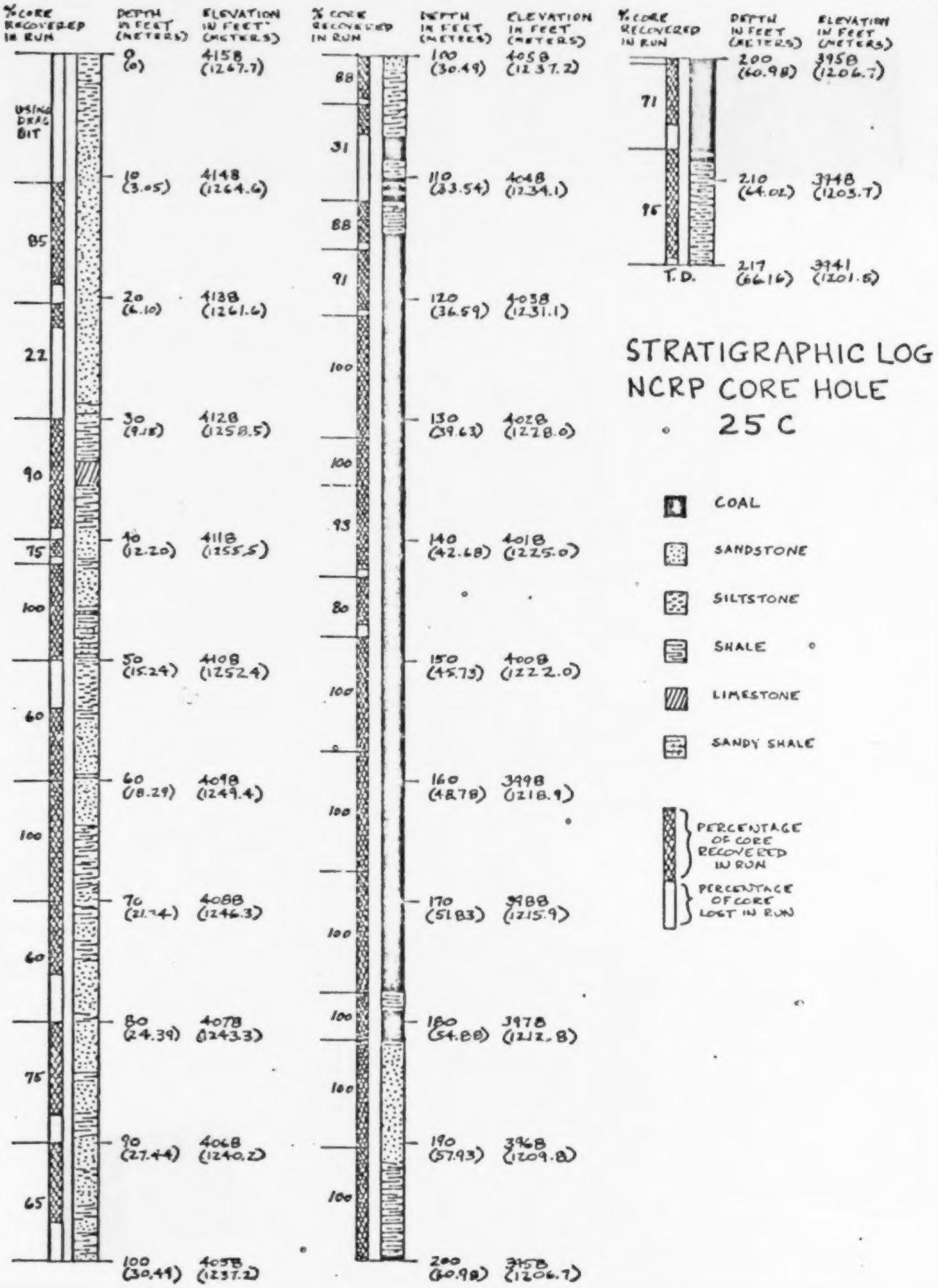
CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
9-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 24 (CANYON COAL AQUIFER) 2 of 2

DATE		092177	121277	MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	9.00	13.14	3.36	7.00
SODIUM	PPM	110	98.00	105	8.24	7.00
CALCIUM	PPM	54.00	45.00	52.29	10.89	7.00
MAGNESIUM	PPM	37.00	40.00	36.00	5.07	7.00
SULFATE	PPM	106	99.00	106	11.52	7.00
CHLORIDE	PPM	8.00	6.00	5.57	1.68	7.00
CARBONATE	PPM	0.00	0.00	0.86	2.10	7.00
BICARBONATE	PPM	500	464	490	13.50	7.00
FLOURIDE	PPM	0.90	0.94	0.95	0.07	7.00
SILICON DIO	PPM	27.00	25.00	24.43	8.97	7.00
TOTAL P	PPM	0.07	0.01	0.19	0.31	7.00
NITRATE	PPM	1.40	0.40	1.84	0.73	7.00
POTASSIUM	EPM	0.28	0.23	0.34		
SODIUM	EPM	4.78	4.26	4.55		
CALCIUM	EPM	2.69	2.25	2.61		
MAGNESIUM	EPM	3.04	3.29	2.96		
SULFATE	EPM	2.21	2.06	2.21		
CHLORIDE	EPM	0.23	0.17	0.16		
CARBONATE	EPM	0.00	0.00	0.03		
BICARBONATE	EPM	8.19	7.60	8.03		
FLOURIDE	EPM	0.05	0.05	0.05		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		10.80	10.03	10.46	0.47	7.00
TOTAL ANIONS		10.62	9.84	10.43	0.39	7.00
DEVIATION		98.26	98.12	99.86	2.61	7.00
TDS (calc.)		572	525	559	27.05	7.00
TDS @180		578	500	578	38.47	7.00
TOTAL HARDNESS		289	274	279	13.13	7.00
ALKALINITY		410	380	403	11.61	7.00
NON-CARB HARD		0.00	0.00	0.00	0.00	7.00
LAB CONDUCTIVITY		960	843	915	48.56	7.00
FIELD COND.		650	560	605	45.00	2.00
LAB pH		7.80	8.00	7.91	0.20	7.00
FIELD pH		7.45	7.22	6.99	0.33	6.00


% CORE RECOVERED IN RUN
DEPTH IN FEET (METERS)
ELEVATION IN FEET (METERS)
USING DRAG BIT
85
22
90
75
100
60
100
60
75
65
0 (0) 4158 (1267.7)
10 (3.05) 4148 (1264.6)
20 (6.10) 4138 (1261.6)
30 (9.15) 4128 (1258.5)
40 (12.20) 4118 (1255.5)
50 (15.24) 4108 (1252.4)
60 (18.29) 4098 (1249.4)
70 (21.34) 4088 (1246.3)
80 (24.39) 4078 (1243.3)
90 (27.44) 4068 (1240.2)
100 (30.49) 4058 (1237.2)
88
31
88
91
100
100
93
80
100
100
100
100
100
100
110 (33.54) 4048 (1234.1)
120 (36.59) 4038 (1231.1)
130 (39.63) 4028 (1228.0)
140 (42.68) 4018 (1225.0)
150 (45.73) 4008 (1222.0)
160 (48.78) 3998 (1218.9)
170 (51.83) 3988 (1215.9)
180 (54.88) 3978 (1212.8)
190 (57.93) 3968 (1209.8)
200 (60.98) 3958 (1206.7)
71
95
T.D.
210 (64.02) 3948 (1203.7)
217 (66.16) 3941 (1201.6)
STRATIGRAPHIC LOG
NCRP CORE HOLE
25 C
COAL
SANDSTONE
SILTSTONE
SHALE
LIMESTONE
SANDY SHALE
PERCENTAGE OF CORE RECOVERED IN RUN
PERCENTAGE OF CORE LOST IN RUN

Stratigraphic log for NCRP 25C.

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP25C

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4158

DATE	LEVEL	READING	CHANGE
9 16 1976	4036.48	121.52	00.00
10 28 1976	4036.35	121.65	00.13
11 16 1976	4036.43	121.57	-00.08
12 16 1976	4036.87	121.13	-00.44
1 31 1977	4036.81	121.19	00.06
2 28 1977	4036.41	121.59	00.40
4 13 1977	4036.50	121.50	-00.09
4 28 1977	4036.42	121.58	00.08
5 27 1977	4036.57	121.43	-00.15
6 28 1977	4036.50	121.50	00.07
7 26 1977	4036.56	121.44	-00.06
8 30 1977	4036.59	121.41	-00.03
10 27 1977	4036.65	121.35	-00.06
12 12 1977	4036.54	121.46	00.11
1 18 1978	4037.23	120.77	-00.69
2 28 1978	4037.61	120.39	-00.38
3 23 1978	4036.54	121.46	01.07
6 6 1978	4036.62	121.38	-00.08
7 7 1978	4036.61	121.39	00.01
8 10 1978	4036.55	121.45	00.06
10 19 1978	4036.79	121.21	-00.24
4 3 1979	4036.73	121.27	00.06
5 16 1979	4036.76	121.24	-00.03
6 11 1979	4036.73	121.27	00.03
7 24 1979	4036.75	121.25	-00.02
8 16 1979	4036.77	121.23	-00.02

6-1/2"
8-1/8"
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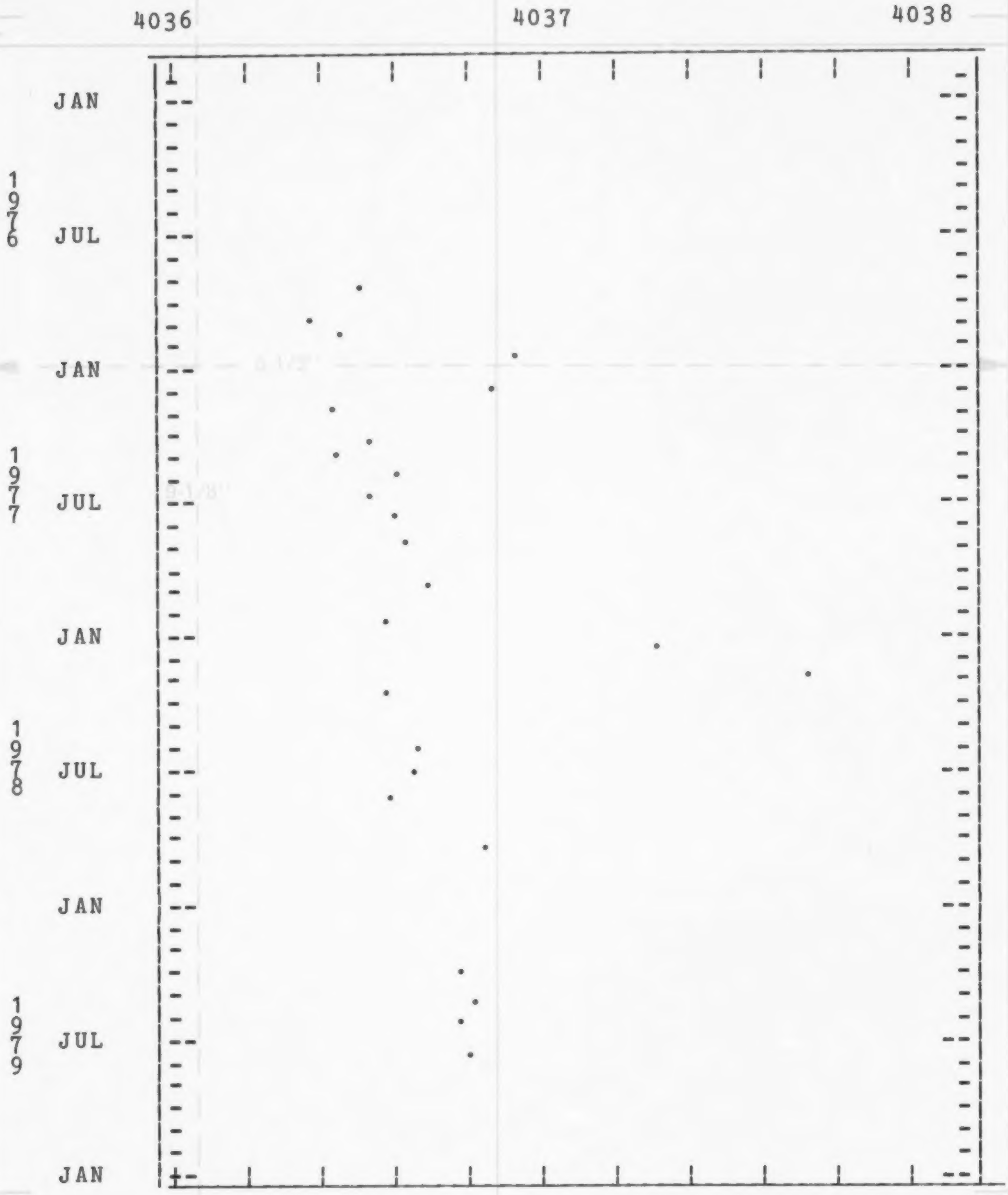
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP25C

WATER LEVEL (FEET ABOVE MSL)



EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG

Well: NCRP #26
Date Completed: 5/27/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-1'	1'	Top Soil, Light Brown Color
1'-11'	10'	Yellowish-Sandy Clay
11'-16'	5'	Gray Sandy Clay
16'-24'	8'	Brown Shale
24'-30'	6'	Gray Shale
30'-31'	1'	1 ft. Coal - (Black Shale)
31'-35'	4'	Gray Shale - Sandy Shale
35'-37'	2'	Gray Sandstone
37'-39'	2'	Hard Gray Sandstone Seam - (Powder Dry)
39'-45'	6'	Gray Soft Sandy (Moist) Shale
45'-58'	13'	Gray Shale
58'-62'	4'	Hard Gray Shale (Powder)
62'-71'	9'	Black Shale (Coal?)
71'-73'	2'	1 ft. Black Coal
73'-76'	3'	Mixed Colors (Red Clinker Gray - Brown)
76'-80'	4'	Sandy Clay (Dark Gray)
80'-90'	10'	Red-Brown-Gray Clinker

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

#26 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
90'-95'	5'	Scoria
95'-100'	5'	Sandstone, Soft, Red, (Powder)
100'-105'	5'	Red Clay - Very Moist
105'-110'	5'	Red Clay - Not as moist
110'-115'	5'	Red Clay - Getting Drier
115'-120'	5'	Red. Very Fine Powder Like, Damp
120'-135'	15'	Reddish Brown Silt
135'-141'	6'	Reddish Brown Sandstone
141'-143'	2'	Hard Seam of Red Shale
143'-190'	47'	Red Scoria Burn
190'-219'	29'	Coal
219'-220'-	1'	Gray Clay

1 of 1

WELL NCRP26

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 4270

DATE	LEVEL	READING	CHANGE
7 27 1976	4093.73	176.27	00.00
9 1 1976	4093.57	176.43	00.16
9 13 1976	4093.37	176.63	00.20
10 12 1976	4085.66	184.34	07.71
10 28 1976	4085.53	184.47	00.13
11 16 1976	4082.98	187.02	02.55
12 16 1976	4085.50	184.50	-02.52
1 31 1977	4084.70	185.30	00.80
2 28 1977	4083.88	186.12	00.82
4 13 1977	4083.71	186.29	00.17
4 28 1977	4083.11	186.89	00.60
5 27 1977	4081.87	188.13	01.24
8 30 1977	4080.82	189.18	01.05

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 26 (CANYON COAL AQUIFER) 1 of 2

DATE		101276	121676	041377
POTASSIUM	PPM	43.00	180	32.00
SODIUM	PPM	450	410	500
CALCIUM	PPM	80.00	60.00	51.00
MAGNESIUM	PPM	7.00	16.00	16.00
SULFATE	PPM	73.00		
CHLORIDE	PPM	23.00	5.00	25.00
CARBONATE	PPM	0.00	264	48.00
BICARBONATE	PPM	1391	1110	1427
FLOURIDE	PPM	0.50	0.70	0.72
SILICON DIO	PPM	29.00	36.00	23.00
TOTAL P	PPM	3.30	0.20	1.50
NITRATE	PPM	1.00	1.00	0.30
POTASSIUM	EPM	1.10	4.60	0.82
SODIUM	EPM	19.57	17.84	21.75
CALCIUM	EPM	3.99	2.99	2.54
MAGNESIUM	EPM	0.58	1.32	1.32
SULFATE	EPM	1.52		
CHLORIDE	EPM	0.65	0.14	0.71
CARBONATE	EPM	0.00	8.80	1.60
BICARBONATE	EPM	22.80	18.19	23.39
FLOURIDE	EPM	0.03	0.04	0.04
NITRATE	EPM	0.05	0.00	0.02
TOTAL CATIONS		25.24	26.75	26.43
TOTAL ANIONS		24.88	47.94	46.37
DEVIATION		98.55	179	175
TDS (calc.)		1361	1482	1375
TDS @180		1576	1488	1372
TOTAL HARDNESS		229	214	195
ALKALINITY		1140	1350	1250
NON-CARB HARD		0.00	0.00	0.00
LAB CONDUCTIVITY		2600	2750	2500
FIELD COND.				
LAB pH		7.50	7.30	8.30
FIELD pH			7.20	7.50

BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 26 (CANYON COAL AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	85.00	67.33	3.00
SODIUM	PPM	453	36.82	3.00
CALCIUM	PPM	63.67	12.12	3.00
MAGNESIUM	PPM	13.00	4.24	3.00
SULFATE	PPM	73.00	0.00	1.00
CHLORIDE	PPM	17.67	8.99	3.00
CARBONATE	PPM	104	115	3.00
BICARBONATE	PPM	1309	142	3.00
FLOURIDE	PPM	0.64	0.10	3.00
SILICON DIO	PPM	29.33	5.31	3.00
TOTAL P	PPM	1.67	1.27	3.00
NITRATE	PPM	0.77	0.33	3.00
POTASSIUM	EPM	2.17		
SODIUM	EPM	19.72		
CALCIUM	EPM	3.18		
MAGNESIUM	EPM	1.07		
SULFATE	EPM	1.52		
CHLORIDE	EPM	0.50		
CARBONATE	EPM	3.47		
BICARBONATE	EPM	21.46		
FLOURIDE	EPM	0.03		
NITRATE	EPM	0.03		
TOTAL CATIONS		26.14	0.65	3.00
TOTAL ANIONS		39.73	10.52	3.00
DEVIATION		151	37.17	3.00
TDS (calc.)		1406	54.05	3.00
TDS @180		1479	83.55	3.00
TOTAL HARDNESS		213	13.91	3.00
ALKALINITY		1247	85.76	3.00
NON-CARB HARD		0.00	0.00	3.00
LAB CONDUCTIVITY		2617	103	3.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.70	0.43	3.00
FIELD pH		7.35	0.15	2.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 2

WELL TRW8

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3100

DATE	LEVEL	READING	CHANGE
10 30 1975	3090.26	9.74	00.00
11 6 1975	3089.98	10.02	00.28
1 13 1975	3089.88	10.12	00.10
1 19 1975	3089.84	10.16	00.04
11 25 1975	3089.80	10.20	00.04
12 4 1975	3090.02	9.98	-00.22
12 10 1975	3090.15	9.85	-00.13
1 16 1976	3090.61	9.39	-00.46
3 1 1976	3090.76	9.24	-00.15
3 17 1976	3090.63	9.37	00.13
4 21 1976	3090.46	9.54	00.17
5 27 1976	3090.87	9.13	-00.41
7 6 1976	3091.04	8.96	-00.17
7 27 1976	3090.50	9.50	00.54
9 2 1976	3090.15	9.85	00.35
9 15 1976	3090.11	9.89	00.04
10 20 1976	3090.05	9.95	00.06
11 18 1976	3090.00	10.00	00.05
12 21 1976	3087.86	12.14	02.14
1 20 1977	3090.33	9.67	-02.47
2 22 1977	3090.54	9.46	-00.21
4 4 1977	3090.02	9.98	00.52
5 2 1977	3090.76	9.24	-00.74
5 26 1977	3091.27	8.73	-00.51
6 20 1977	3091.21	8.79	00.06
7 25 1977	3090.45	9.55	00.76
8 24 1977	3090.13	9.87	00.32
12 19 1977	3090.18	9.82	-00.05
1 20 1978	3090.30	9.70	-00.12
6 6 1978	3094.05	5.95	-03.75
8 30 1978	3091.03	8.97	03.02
10 16 1978	3090.30	9.70	00.73
11 3 1978	3090.09	9.91	00.21
12 6 1978	3090.73	9.27	-00.64
2 21 1979	3090.50	9.50	00.23
3 6 1979	3091.57	8.43	-01.07
3 9 1979	3091.87	8.13	-00.30
3 29 1979	3090.47	9.53	01.40
4 9 1979	3091.08	8.92	-00.61
4 25 1979	3090.93	9.07	00.15

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
6-1/2"
9-1/8"
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

2 of 2

WELL TRW8

GROUNDWATER LEVELS (FEET--DATUM MSL)

DATE	LEVEL	READING	CHANGE
5 8 1979	3090.97	9.03	-00.04
5 31 1979	3091.22	8.78	-00.25
6 7 1979	3091.40	8.60	-00.18
6 14 1979	3091.16	8.84	00.24
7 20 1979	3090.99	9.01	00.17
1 1 1910	3099.00	1.00	-08.01
1 1 1910	3099.00	1.00	00.00
1 1 1910	3099.00	1.00	00.00

6-1/2"
9-1/8"
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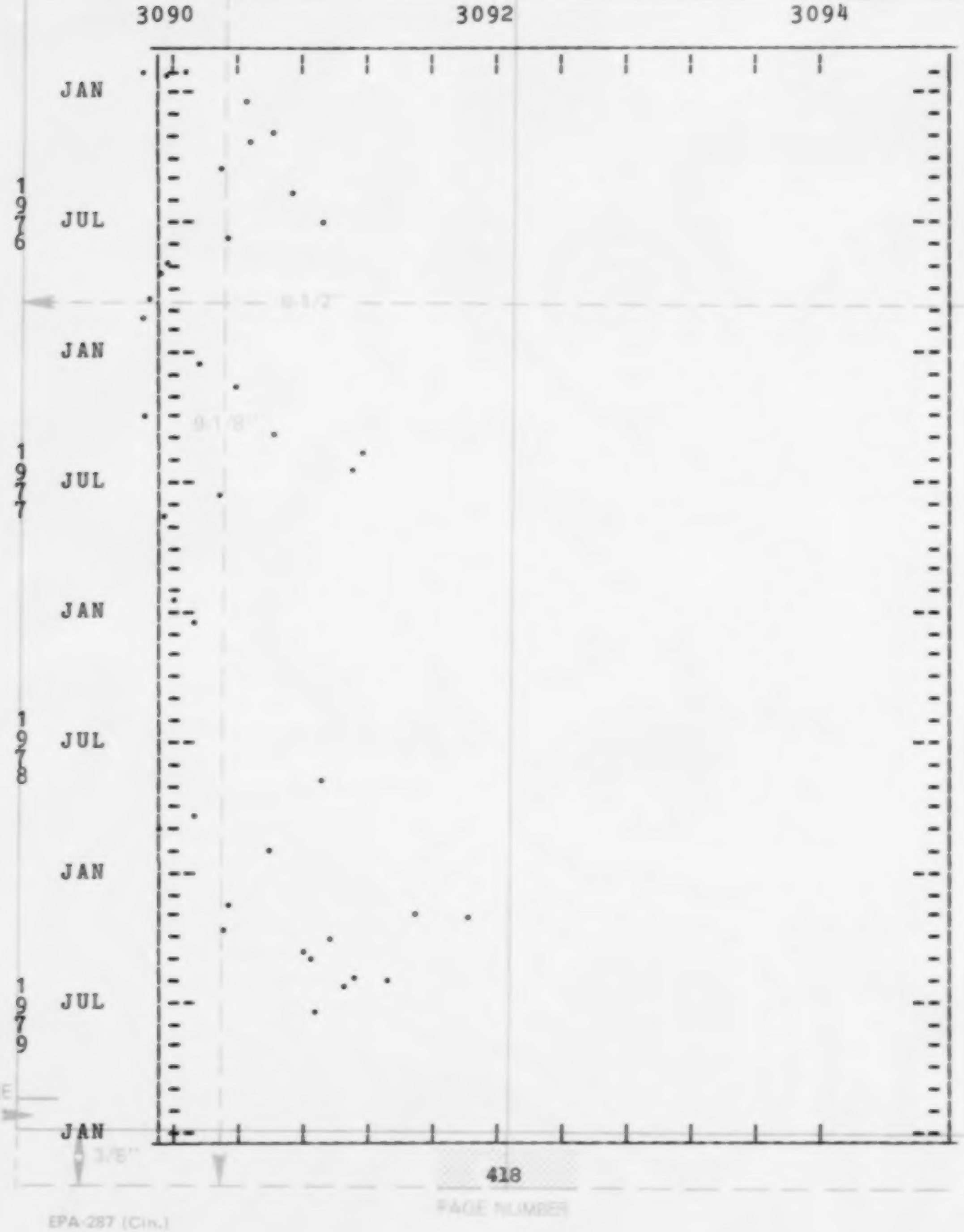
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL TRW8

WATER LEVEL (FEET ABOVE M.S.L.)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #12
Date Completed 12/4/75

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-20'	20'	Sandy Clay, Brown, water gravel 5'7", Balling 10'
20'-23'	3'	Gravel, Wet
23'-29'	6'	Shale, Gray
29'-34'	5'	Shale, Gray
34'-40'	6'	Shale, Gray, (H_2O)
40'-48'	8'	Shale, Gray, (H_2O)
48'-51'	3'	Gravel, Red, H_2O
51'-53'	2'	Shale, Black, H_2O
53'-59'	6'	Coal
59'-62'	3'	Gravel, H_2O
62'-75'	13'	Coal
75'-80'	5'	Sandstone, Gray, Gravel
80'-98'	18'	H_2O Continues 100 GPM
98'-104'	6'	Coal Chips, Suphur Smell
104'-116'	12'	Sandy Shale, Coal Chips
116'-120'	4'	Sand Brown, Coal Chips

8-1/2"
9-1/8"
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3/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

WELL NCRP12A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3152

DATE	LEVEL	READING	CHANGE
12 10 1975	3130.41	21.59	00.00
1 16 1975	3131.31	20.69	-00.90
2 9 1976	3130.62	21.38	00.69
3 1 1976	3130.74	21.26	-00.12
3 17 1976	3130.62	21.38	00.12
4 21 1976	3130.90	21.10	-00.28
5 27 1976	3130.42	21.58	00.48
7 6 1976	3131.40	20.60	-00.98
7 27 1976	3130.37	21.63	01.03
9 2 1976	3129.43	22.57	00.94
9 15 1976	3129.27	22.73	00.16
10 20 1976	3130.95	21.05	-01.68
11 18 1976	3130.95	21.05	00.00
12 21 1976	3130.94	21.06	00.01
1 20 1977	3131.13	20.87	-00.19
2 22 1977	3131.15	20.85	-00.02
4 4 1977	3131.07	20.93	00.08
5 2 1977	3131.24	20.76	-00.17
5 26 1977	3131.42	20.58	-00.18
6 20 1977	3131.42	20.58	00.00
7 25 1977	3130.45	21.55	00.97
8 24 1977	3130.43	21.57	00.02
12 19 1977	3130.68	21.32	-00.25
1 19 1978	3130.50	21.50	00.18
3 7 1978	3130.50	21.50	00.00
8 30 1978	3131.20	20.80	-00.70
10 19 1978	3131.28	20.72	-00.08
12 6 1978	3131.13	20.87	00.15
1 30 1979	3130.55	21.45	00.58
3 6 1979	3130.79	21.21	-00.24
3 9 1979	3131.04	20.96	-00.25
3 11 1979	3131.16	20.84	-00.12
3 29 1979	3131.80	20.20	-00.64
6 7 1979	3131.61	20.39	00.19
6 12 1979	3131.60	20.40	00.01
6 18 1979	3131.58	20.42	00.02
7 10 1979	3131.20	20.80	00.38

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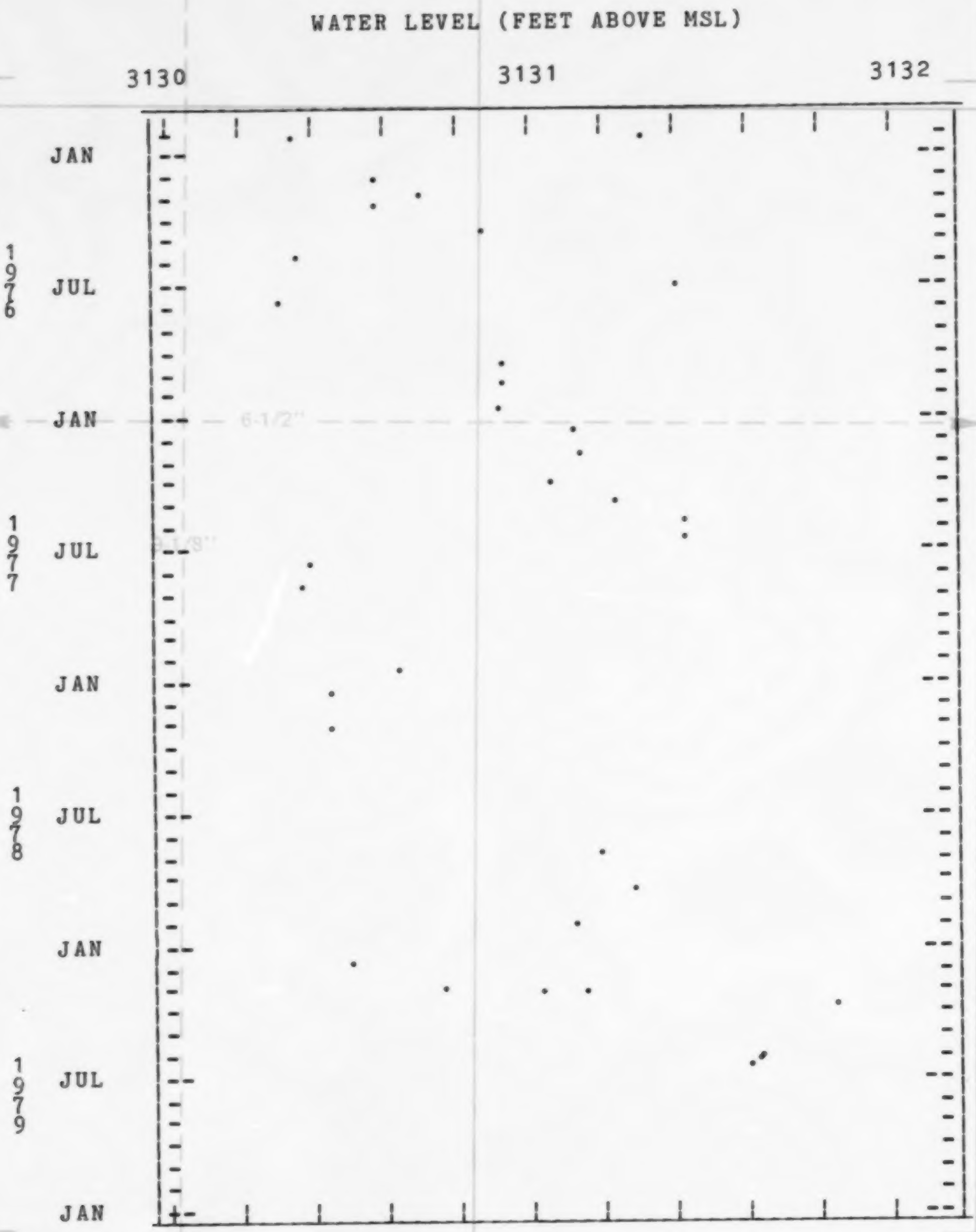
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP12A



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9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 12A　　　　1 of 3

DATE		020976	032576	070776	091576	122176
POTASSIUM	PPM	11.00	12.00	7.00	21.00	15.00
SODIUM	PPM	220	210	215	204	200
CALCIUM	PPM	32.00	52.00	54.00	64.00	60.00
MAGNESIUM	PPM	40.00	40.00	37.00	30.00	31.00
SULFATE	PPM	484	475	486	499	502
CHLORIDE	PPM	6.00	6.00	11.00	12.00	8.00
CARBONATE	PPM	60.00	0.00	0.00	5.00	0.00
BICARBONATE	PPM	159	317	311	251	244
FLOURIDE	PPM	1.90	2.10	1.80	1.90	2.10
SILICON DIO	PPM	19.00	17.00	21.00	26.00	26.00
TOTAL P	PPM	0.15	1.00	0.04	0.02	1.00
NITRATE	PPM	1.00	1.00	3.00	2.00	1.00
POTASSIUM	EPM	0.28	0.31	0.18	0.54	0.38
SODIUM	EPM	9.57	9.13	9.35	8.87	8.70
CALCIUM	EPM	1.60	2.59	2.69	3.19	2.99
MAGNESIUM	EPM	3.29	3.29	3.04	2.47	2.55
SULFATE	EPM	10.08	9.89	10.12	10.39	10.45
CHLORIDE	EPM	0.17	0.17	0.31	0.34	0.23
CARBONATE	EPM	2.00	0.00	0.00	0.17	0.00
BICARBONATE	EPM	2.61	5.20	5.10	4.11	4.00
FLOURIDE	EPM	0.10	0.11	0.09	0.10	0.11
NITRATE	EPM	0.00	0.02	0.00	0.00	0.02
TOTAL CATIONS		14.74	15.33	15.27	15.07	14.63
TOTAL ANIONS		14.91	15.34	15.54	15.02	14.74
DEVIATION		101	100	102	99.65	101
TDS (calc.)		931	950	963	959	936
TDS @180		970	985	991	1009	976
TOTAL HARDNESS		243	294	286	283	278
ALKALINITY		230	260	255	214	200
NON-CARB HARD		13.00	34.00	31.00	69.00	78.00
LAB CONDUCTIVITY		1400	1600	1400	1200	1420
FIELD COND.						
LAB pH		9.20	8.10	8.30	8.80	8.10
FIELD pH		9.10	7.10	8.40	7.10	7.10

EPA-287 (Cin.)
(4-76)

WELL NCRP 12A

2 of 3

DATE		040477	062077	111077	121977
POTASSIUM	PPM	13.00	16.00	10.00	16.00
SODIUM	PPM	200	215	210	220
CALCIUM	PPM	74.00	55.00	70.00	54.00
MAGNESIUM	PPM	20.00	33.00	59.00	35.00
SULFATE	PPM	505	505	506	519
CHLORIDE	PPM	8.00	13.00	11.00	10.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	244	244	451	281
FLOURIDE	PPM	2.20	1.90	1.60	2.30
SILICON DIO	PPM	25.00	29.00	21.00	24.00
TOTAL P	PPM	0.03	0.18	1.00	0.29
NITRATE	PPM	0.80	0.20	1.00	1.00
POTASSIUM	EPM	0.33	0.41	0.26	0.41
SODIUM	EPM	8.70	9.35	9.13	9.57
CALCIUM	EPM	3.69	2.74	3.49	2.69
MAGNESIUM	EPM	1.65	2.71	4.85	2.88
SULFATE	EPM	10.51	10.51	10.53	10.81
CHLORIDE	EPM	0.23	0.37	0.31	0.28
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	4.00	4.00	7.39	4.61
FLOURIDE	EPM	0.12	0.10	0.08	0.12
NITRATE	EPM	0.00	0.00	0.02	0.00
TOTAL CATIONS		14.37	15.22	17.74	15.55
TOTAL ANIONS		14.80	14.89	18.26	15.75
DEVIATION		103	97.81	103	101
TDS (calc.)		940	957	1088	992
TDS @180		953	1007	1095	930
TOTAL HARDNESS		267	273	419	279
ALKALINITY		200	200	370	230
NON-CARB HARD		67.00	73.00	49.00	49.00
LAB CONDUCTIVITY		1440	1504	1529	1372
FIELD COND.				2280	940
LAB pH		8.20	7.80	7.90	8.10
FIELD pH		7.70		7.20	8.38

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
9-1/8"
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 12A 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	13.44	3.86	9.00
SODIUM	PPM	210	7.34	9.00
CALCIUM	PPM	57.22	11.49	9.00
MAGNESIUM	PPM	36.11	9.94	9.00
SULFATE	PPM	498	12.86	9.00
CHLORIDE	PPM	9.44	2.41	9.00
CARBONATE	PPM	7.22	18.72	9.00
BICARBONATE	PPM	278	75.21	9.00
FLOURIDE	PPM	1.98	0.20	9.00
SILICON DIO	PPM	23.11	3.63	9.00
TOTAL P	PPM	0.41	0.42	9.00
NITRATE	PPM	1.22	0.76	9.00
POTASSIUM	EPM	0.34		
SODIUM	EPM	9.15		
CALCIUM	EPM	2.86		
MAGNESIUM	EPM	2.97		
SULFATE	EPM	10.37		
CHLORIDE	EPM	0.27		
CARBONATE	EPM	0.24		
BICARBONATE	EPM	4.56		
FLOURIDE	EPM	0.10		
NITRATE	EPM	0.01		
TOTAL CATIONS		15.32	0.92	9.00
TOTAL ANIONS		15.47	1.04	9.00
DEVIATION		101	1.53	9.00
TDS (calc.)		968	45.59	9.00
TDS @180		991	43.79	9.00
TOTAL HARDNESS		291	47.14	9.00
ALKALINITY		240	50.77	9.00
NON-CARB HARD		51.44	20.90	9.00
LAB CONDUCTIVITY		1429	107	9.00
FIELD COND.		1610	670	2.00
LAB pH		8.28	0.42	9.00
FIELD pH		7.76	0.73	8.00

EPA-287 (Cin.)
(4-76)

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TYPING GUIDE SHEET

CENTER OF PAGE

TOP OF IMAGE AREA

1 of 1

WELL NCRP12B

GROUNDWATER LEVELS (FEET--DATUM MSL)

DROPPED HEAD; BEGIN SECTIONS HERE

elevation at top of well casing is 3152

DATE	LEVEL	READING	CHANGE
12 10 1975	3130.41	21.59	00.00
1 16 1976	3131.31	20.69	-00.90
2 9 1976	3130.62	21.38	00.69
3 1 1976	3130.74	21.26	-00.12
3 17 1976	3130.62	21.38	00.12
4 21 1976	3130.90	21.10	-00.28
5 27 1976	3130.42	21.58	00.48
7 6 1976	3131.40	20.60	-00.98
7 27 1976	3130.37	21.63	01.03
9 2 1976	3129.43	22.57	00.94
9 15 1976	3129.27	22.73	00.16
10 20 1976	3130.95	21.05	-01.68
11 18 1976	3130.95	21.05	00.00
12 21 1976	3130.94	21.06	00.01
1 20 1977	3131.13	20.87	-00.19
2 22 1977	3131.15	20.85	-00.02
4 4 1977	3131.07	20.93	00.08
5 2 1977	3131.24	20.76	-00.17
5 26 1977	3131.42	20.58	-00.18
6 20 1977	3131.15	20.85	00.27
7 25 1977	3130.45	21.55	00.70
8 24 1977	3130.43	21.57	00.02
12 19 1977	3130.67	21.33	-00.24
1 19 1978	3130.50	21.50	00.17
3 7 1978	3130.50	21.50	00.00
8 30 1978	3130.67	21.33	-00.17
10 19 1978	3131.12	20.88	-00.45
12 6 1978	3131.04	20.96	00.08
1 30 1979	3130.47	21.53	00.57
3 6 1979	3130.35	21.65	00.12
3 9 1979	3130.72	21.28	-00.37
5 29 1979	3131.53	20.47	-00.81
6 7 1979	3131.65	20.35	-00.12
6 12 1979	3131.54	20.46	00.11
6 18 1979	3131.47	20.53	00.07
7 10 1979	3130.98	21.02	00.49

6-1/2"

9-1/8"

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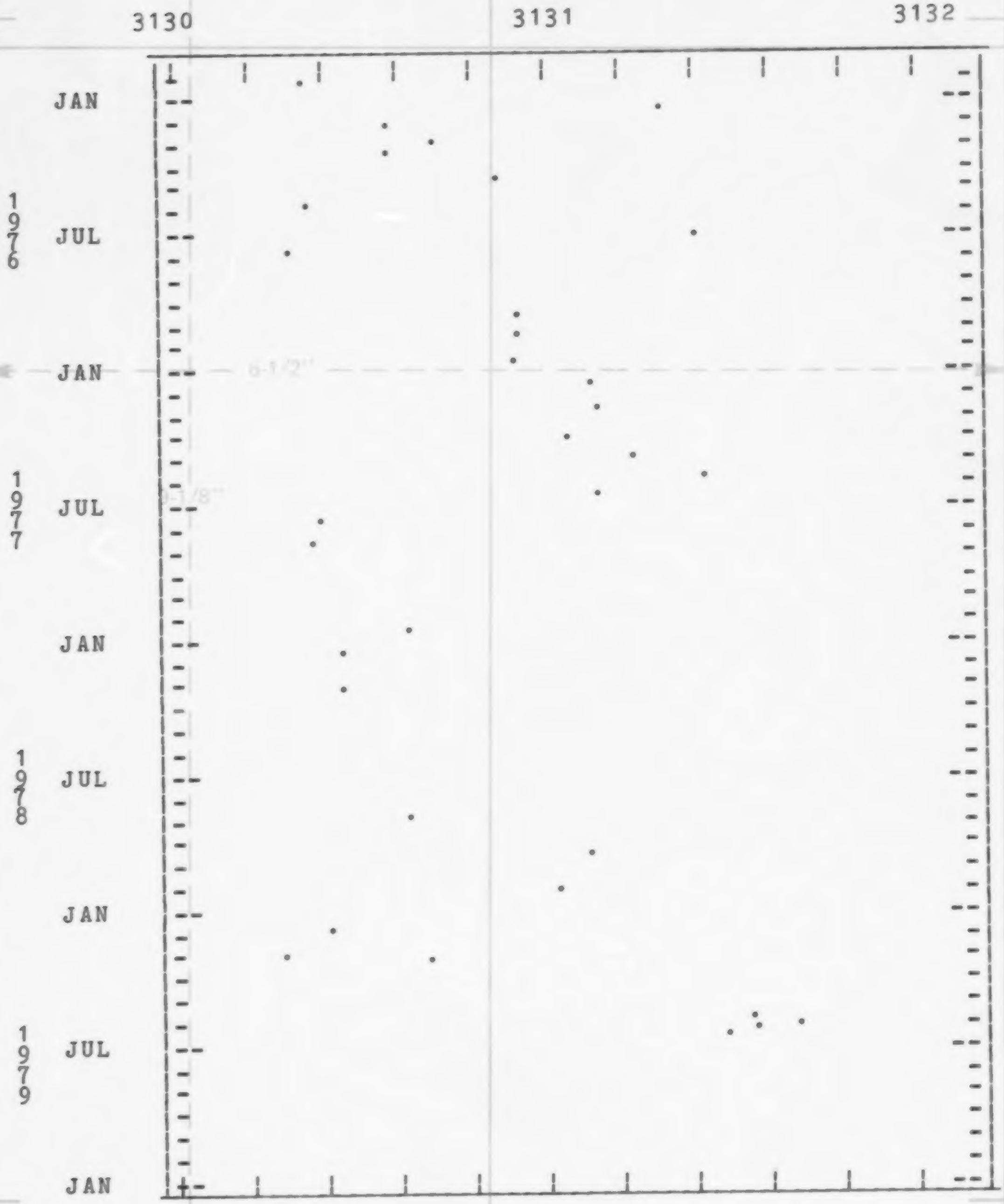
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

HYDROGRAPH FOR WELL NCRP12B



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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
8-1/2"
9-1/8"
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 12B 1 of 3

DATE		021076	032576	070676	091576	122176
POTASSIUM	PPM	58.00	28.00	15.00	15.00	15.00
SODIUM	PPM	500	305	315	315	290
CALCIUM	PPM	82.00	26.00	50.00	40.00	68.00
MAGNESIUM	PPM	5.00	54.00	76.00	38.00	82.00
SULFATE	PPM	946	576	611	533	609
CHLORIDE	PPM	18.00	6.00	12.00	13.00	9.00
CARBONATE	PPM	12.00	48.00	6.00	60.00	0.00
BICARBONATE	PPM	126	354	610	307	622
FLOURIDE	PPM	0.90	1.70	1.40	1.00	1.60
SILICON DIO	PPM	15.00	17.00	15.00	29.00	20.00
TOTAL P	PPM	0.11	0.10	0.10	0.03	0.01
NITRATE	PPM	0.10	1.00	1.00	3.00	1.00
POTASSIUM	EPM	1.48	0.72	0.38	0.38	0.38
SODIUM	EPM	21.75	13.27	13.70	13.70	12.61
CALCIUM	EPM	4.09	1.30	2.49	2.00	3.39
MAGNESIUM	EPM	0.41	4.44	6.25	3.13	6.75
SULFATE	EPM	19.70	11.99	12.72	11.10	12.68
CHLORIDE	EPM	0.51	0.17	0.34	0.37	0.25
CARBONATE	EPM	0.40	1.60	0.20	2.00	0.00
BICARBONATE	EPM	2.07	5.80	10.00	5.03	10.19
FLOURIDE	EPM	0.05	0.09	0.07	0.05	0.08
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		27.74	19.72	22.83	19.21	23.14
TOTAL ANIONS		22.58	19.61	23.24	18.45	23.15
DEVIATION		81.43	99.41	102	96.07	100
TDS (calc.)		1747	1217	1385	1165	1379
TDS @180		1870	1306	1403	1201	1412
TOTAL HARDNESS		225	287	437	257	505
ALKALINITY		390	370	510	352	510
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		5000	2000	2500	1500	2100
FIELD COND.						
LAB pH			8.40	8.20	9.80	8.00
FIELD pH			7.60	7.10	8.10	7.30

EPA-287 (Cin.)
(4-76)

WELL NCRP 12B 2 of 3

DATE		040477	062077	121977
POTASSIUM	PPM	20.00	19.00	20.00
SODIUM	PPM	760	540	390
CALCIUM	PPM	129	162	109
MAGNESIUM	PPM	152	111	72.00
SULFATE	PPM	1893	1557	1042
CHLORIDE	PPM	10.00	15.00	14.00
CARBONATE	PPM	0.00	0.00	0.00
BICARBONATE	PPM	708	512	451
FLOURIDE	PPM	1.50	1.30	1.30
SILICON DIO	PPM	17.00	18.00	15.00
TOTAL P	PPM	0.09	0.08	0.09
NITRATE	PPM	6.20	0.10	0.10
POTASSIUM	EPM	0.51	0.49	0.51
SODIUM	EPM	33.06	23.49	16.96
CALCIUM	EPM	6.44	8.08	5.44
MAGNESIUM	EPM	12.50	9.13	5.92
SULFATE	EPM	39.41	32.42	21.69
CHLORIDE	EPM	0.28	0.42	0.39
CARBONATE	EPM	0.00	0.00	0.00
BICARBONATE	EPM	11.60	8.39	7.39
FLOURIDE	EPM	0.08	0.07	0.07
NITRATE	EPM	0.00	0.00	0.00
TOTAL CATIONS		52.51	41.19	28.84
TOTAL ANIONS		51.30	41.19	29.45
DEVIATION		97.70	100.00	102
TDS (calc.)		3312	2656	1869
TDS @180		3277	2685	1894
TOTAL HARDNESS		946	859	568
ALKALINITY		580	420	370
NON-CARB HARD		366	439	198
LAB CONDUCTIVITY		4200	3492	2548
FIELD COND.				1720
LAB pH		7.80	7.90	8.00
FIELD pH		7.20		

WELL NCRP 12B

3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	23.75	13.56	8.00
SODIUM	PPM	427	154	8.00
CALCIUM	PPM	83.25	43.94	8.00
MAGNESIUM	PPM	73.75	41.81	8.00
SULFATE	PPM	971	475	8.00
CHLORIDE	PPM	12.12	3.52	8.00
CARBONATE	PPM	15.75	22.64	8.00
BICARBONATE	PPM	461	180	8.00
FLOURIDE	PPM	1.34	0.26	8.00
SILICON DIO	PPM	18.25	4.38	8.00
TOTAL P	PPM	0.05	0.07	8.00
NITRATE	PPM	0.76	2.39	8.00
POTASSIUM	EPM	0.61		
SODIUM	EPM	18.57		
CALCIUM	EPM	4.15		
MAGNESIUM	EPM	6.07		
SULFATE	EPM	20.21		
CHLORIDE	EPM	0.34		
CARBONATE	EPM	0.52		
BICARBONATE	EPM	7.56		
FLOURIDE	EPM	0.07		
NITRATE	EPM	0.00		
TOTAL CATIONS		29.40	10.93	8.00
TOTAL ANIONS		28.62	10.92	8.00
DEVIATION		97.32	6.29	8.00
TDS (calc.)		1841	716	8.00
TDS @180		1881	693	8.00
TOTAL HARDNESS		510	254	8.00
ALKALINITY		438	78.90	8.00
NON-CARB HARD		125	173	8.00
LAB CONDUCTIVITY		2917	1126	8.00
FIELD COND.		1720	0.00	1.00
LAB pH		8.30	0.64	7.00
FIELD pH		7.46	0.36	5.00

PAGE NUMBER
EPA-287 (Cin.)
(6-78)

LITHOLOGIC LOG

Well: NCRP #11
Date Completed: 12/10/75

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-15'	15'	Sandy Clay, Light Brown
15'-23'	8'	Sandstone, Gray, Fine
23'-28'	5'	Sandstone, Light Gray, Hard
28'-29'	1'	Sandstone, Hard
29'-35'	6'	Sandstone, Brown, Balling, Hard Layer
35'-36'	1'	Clay, Orange
36'-37'	1'	Coal
37'-39'	2'	Shale, Gray
39'-45'	6'	Coal, Stink-smell
45'-45.6'	.6'	Sandy Clay, Gray, Water in Coal
45.6'-49'	3.4'	Shale, Gray
49'-52'	3'	Shale, Gray, Water, Bedded Sandstone
52'-58'	3'	Shale, Gray, Hard
58'-58.5'	.5'	Sandstone, Hard
58.5'-70'	21.5'	Shale, Gray, Soft, Balling
70'-75'	5'	Sandy, Shale, Gray, Balling
75'-87'	12'	Shale, Gray, H_2O

6-1/2"
9-1/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#11 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
87'-88'	1'	Sandstone, Gray, Hard
88'-91'	3'	Sandstone, Gray
91'-95'	4'	Shale, Gray
95'-95.5'	.5'	Coal
95.5'-118'	22.5'	Shale, Gray, Brown, Clean Hole, H_2O
118'-119'	1'	Sandstone, Hard Layer Shale, Gray
119'-139'	20'	Shale, Gray, Switched to H_2O
139'-145'	6'	Shale, Brown
145'-160'	15'	Sandy Shale, Gray
160'-182'	22'	Shale, Brown, Gray
182'-195'	13'	Coal, Black
195'-205'	10'	(192 H_2O) Shale, Gray
205'-245'	40'	Sandstone, Gray, Fine
245'-250'	5'	Shale, Gray
250'-265'	15'	Coal, Black (H_2O)

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP11A

GROUNDWATER LEVELS (FEET--DATUM MSL)

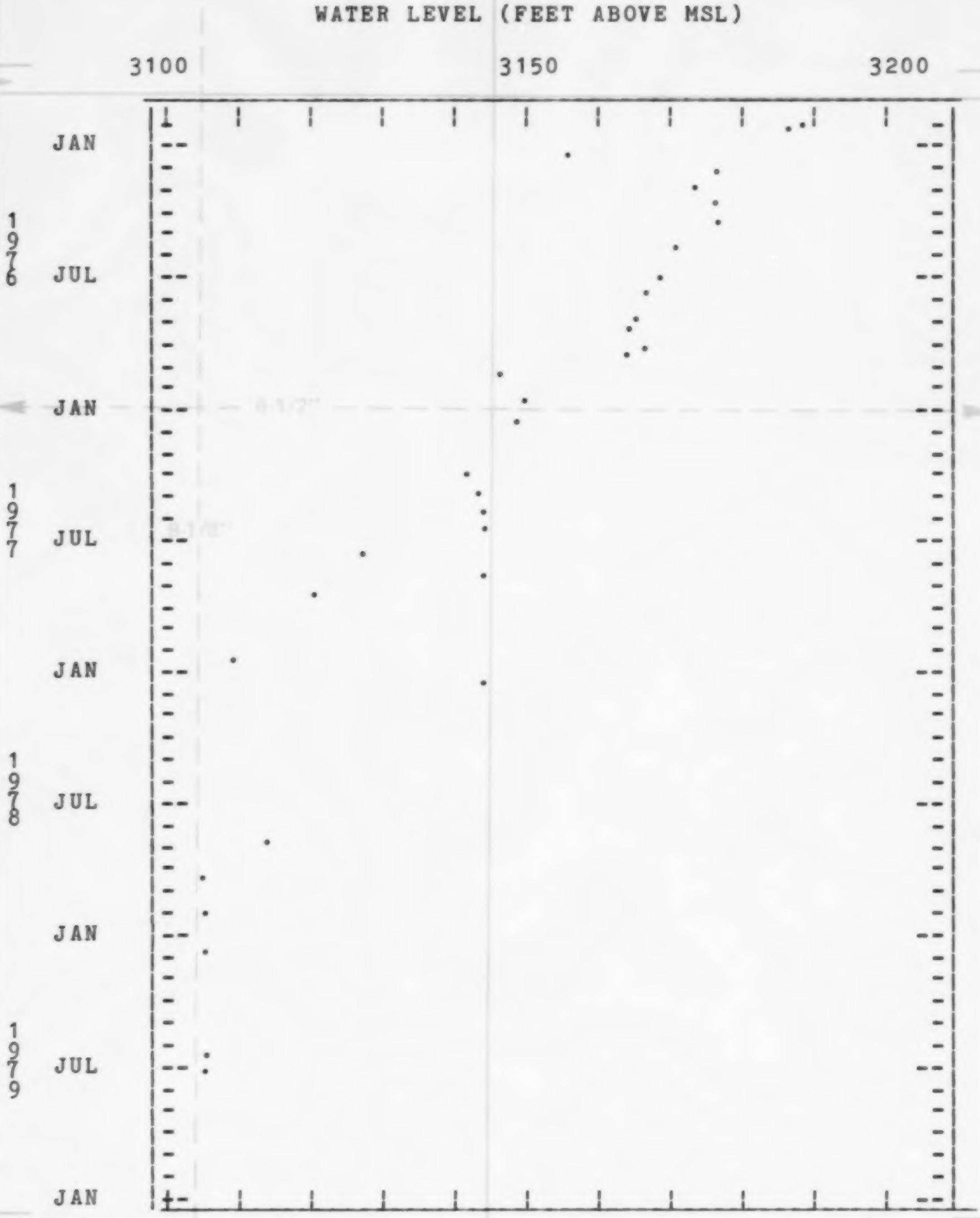
elevation at top of well casing is 3302

DATE	LEVEL	READING	CHANGE
12 4 1975	3186.80	115.20	00.00
12 10 1975	3184.94	117.06	01.86
1 16 1976	3156.10	145.90	28.84
2 9 1976	3175.64	126.36	-19.54
3 1 1976	3172.80	129.20	02.84
3 25 1976	3175.46	126.54	-02.66
4 21 1976	3175.83	126.17	-00.37
5 27 1976	3170.11	131.89	05.72
7 6 1976	3168.11	133.89	02.00
7 27 1976	3166.44	135.56	01.67
9 2 1976	3165.02	136.98	01.42
9 15 1976	3164.24	137.76	00.78
10 12 1976	3166.20	135.80	-01.96
10 20 1976	3163.92	138.08	02.28
11 18 1976	3147.37	154.63	16.55
12 21 1976	3150.56	151.44	-03.19
1 20 1977	3149.61	152.39	00.95
4 4 1977	3143.02	158.98	06.59
5 2 1977	3144.55	157.45	-01.53
5 26 1977	3145.22	156.78	-00.67
6 20 1977	3145.47	156.53	-00.25
7 26 1977	3129.59	172.41	15.88
8 24 1977	3145.20	156.80	-15.61
9 21 1977	3123.24	178.76	21.96
12 20 1977	3112.68	189.32	10.56
1 19 1978	3145.18	156.82	-32.50
8 30 1978	3117.00	185.00	28.18
10 19 1978	3108.70	193.30	08.30
12 6 1978	3109.00	193.00	-00.30
1 30 1979	3109.05	192.95	-00.05
6 18 1979	3109.22	192.78	-00.17
7 10 1979	3109.15	192.85	00.07
8 7 1979	3108.58	193.42	00.57

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP11A



EPA-287 (Cin.)
(4-76)

WELL NCRP 11A (KNOBLOCH COAL AQUIFER) 1 of 3

DATE		032576	020976	070676	101276	122176
POTASSIUM	PPM	8.00	8.00	15.00	7.00	5.00
SODIUM	PPM	528	575	555	530	567
CALCIUM	PPM	16.00	10.00	10.00	22.00	16.00
MAGNESIUM	PPM	19.00	16.00	14.00	2.00	5.00
SULFATE	PPM	267	300	274	276	281
CHLORIDE	PPM	11.00	8.00	15.00	16.00	12.00
CARBONATE	PPM	0.00	0.00	60.00	60.00	0.00
BICARBONATE	PPM	1244	1269	1135	1025	1171
FLOURIDE	PPM	7.90	8.60	8.40	0.43	2.30
SILICON DIO	PPM	14.00	17.00	9.00	10.00	10.00
TOTAL P	PPM	0.10	0.28	0.12	0.15	0.14
NITRATE	PPM	1.00	1.50	1.00	1.00	1.00
POTASSIUM	EPM	0.20	0.20	0.38	0.18	0.13
SODIUM	EPM	22.97	25.01	24.14	23.05	24.66
CALCIUM	EPM	0.80	0.50	0.50	1.10	0.80
MAGNESIUM	EPM	1.56	1.32	1.15	0.16	0.41
SULFATE	EPM	5.56	6.25	5.70	5.75	5.85
CHLORIDE	EPM	0.31	0.23	0.42	0.45	0.34
CARBONATE	EPM	0.00	0.00	2.00	2.00	0.00
BICARBONATE	EPM	20.39	20.80	18.60	16.80	19.19
FLOURIDE	EPM	0.42	0.45	0.44	0.02	0.12
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		25.53	27.03	26.18	24.50	26.00
TOTAL ANIONS		26.59	27.67	27.06	24.90	25.42
DEVIATION		104	102	103	102	97.75
TDS (calc.)		1462	1554	1502	1418	1463
TDS @180		1564	1620	1513	1517	1503
TOTAL HARDNESS		119	89.00	81.00	65.00	60.00
ALKALINITY		1020	1040	1030	940	960
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		2700	3000	2700	2300	2400
FIELD COND.						
LAB pH		8.00	7.90	8.30	8.30	8.10
FIELD pH			6.90	9.00	8.70	7.60

EPA-287 (Cin.)
(4-76)

WELL NCRP 11A (KNOBLOCH COAL AQUIFER) 2 of 3

DATE		040477	062077	092177	122077
POTASSIUM	PPM	5.00	7.00	8.00	7.00
SODIUM	PPM	570	570	610	600
CALCIUM	PPM	16.00	18.00	14.00	25.00
MAGNESIUM	PPM	6.00	2.00	9.00	5.00
SULFATE	PPM	287	278	319	357
CHLORIDE	PPM	12.00	15.00	16.00	14.00
CARBONATE	PPM	60.00	0.00	0.00	0.00
BICARBONATE	PPM	1074	1159	1244	1257
FLOURIDE	PPM	9.10	9.80	7.70	9.80
SILICON DIO	PPM	9.00	9.00	9.00	10.00
TOTAL P	PPM	0.10	0.15	0.16	0.34
NITRATE	PPM	0.20	0.50	0.10	0.10
POTASSIUM	EPM	0.13	0.18	0.20	0.18
SODIUM	EPM	24.79	24.79	26.54	26.10
CALCIUM	EPM	0.80	0.90	0.70	1.25
MAGNESIUM	EPM	0.49	0.16	0.74	0.41
SULFATE	EPM	5.98	5.79	6.64	7.43
CHLORIDE	EPM	0.34	0.42	0.45	0.39
CARBONATE	EPM	2.00	0.00	0.00	0.00
BICARBONATE	EPM	17.60	19.00	20.39	20.60
FLOURIDE	EPM	0.48	0.52	0.41	0.52
NITRATE	EPM	0.00	0.00	0.00	0.01
TOTAL CATIONS		26.21	26.04	28.18	27.94
TOTAL ANIONS		26.31	25.61	27.77	28.85
DEVIATION		100	98.38	98.56	103
TDS (calc.)		1485	1461	1589	1627
TDS @180		1512	1536	1568	1639
TOTAL HARDNESS		63.00	54.00	72.00	82.00
ALKALINITY		980	950	1020	1030
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		2450	2376	2406	2401
FIELD COND.				1750	1490
LAB pH		8.30	7.90	8.10	7.90
FIELD pH		7.60		7.65	7.21

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 11A (KNOBLOCH COAL AQUIFER) 3 of 3

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	7.78	2.78	9.00
SODIUM	PPM	567	25.94	9.00
CALCIUM	PPM	16.33	4.67	9.00
MAGNESIUM	PPM	8.67	5.89	9.00
SULFATE	PPM	293	26.98	9.00
CHLORIDE	PPM	13.22	2.53	9.00
CARBONATE	PPM	20.00	28.28	9.00
BICARBONATE	PPM	1175	81.42	9.00
FLOURIDE	PPM	7.11	3.18	9.00
SILICON DIO	PPM	10.78	2.66	9.00
TOTAL P	PPM	0.17	0.08	9.00
NITRATE	PPM	0.24	0.82	9.00
POTASSIUM	EPM	0.20		
SODIUM	EPM	24.67		
CALCIUM	EPM	0.82		
MAGNESIUM	EPM	0.71		
SULFATE	EPM	6.10		
CHLORIDE	EPM	0.37		
CARBONATE	EPM	0.67		
BICARBONATE	EPM	19.26		
FLOURIDE	EPM	0.37		
NITRATE	EPM	0.00		
TOTAL CATIONS		26.40	1.09	9.00
TOTAL ANIONS		26.69	1.20	9.00
DEVIATION		101	2.28	9.00
TDS (calc.)		1507	64.85	9.00
TDS @180		1552	46.66	9.00
TOTAL HARDNESS		76.11	18.63	9.00
ALKALINITY		997	36.82	9.00
NON-CARB HARD		0.00	0.00	9.00
LAB CONDUCTIVITY		2526	214	9.00
FIELD COND.		1620	130	2.00
LAB pH		8.09	0.17	9.00
FIELD pH		7.81	0.71	7.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP11B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3302

DATE	LEVEL	READING	CHANGE
1 16 1976	3256.70	45.30	00.00
2 9 1976	3259.27	42.73	-02.57
3 1 1976	3256.49	45.51	02.78
3 25 1976	3255.25	46.75	01.24
4 24 1976	3256.56	45.44	-01.31
5 27 1976	3255.82	46.18	00.74
7 6 1976	3256.31	45.69	-00.49
7 27 1976	3255.61	46.39	00.70
9 2 1976	3256.21	45.79	-00.60
9 15 1976	3256.21	45.79	00.00
10 20 1976	3256.15	45.85	00.06
11 18 1976	3256.40	45.60	-00.25
12 21 1976	3256.34	45.66	00.06
1 20 1977	3256.29	45.71	00.05
2 22 1977	3256.33	45.67	-00.04
4 4 1977	3254.30	47.70	02.03
5 2 1977	3256.44	45.56	-02.14
5 26 1977	3254.85	47.15	01.59
6 20 1977	3256.00	46.00	-01.15
7 26 1977	3256.39	45.61	-00.39
8 24 1977	3256.38	45.62	00.01
9 21 1977	3256.42	45.58	-00.04
12 20 1977	3256.42	45.58	00.00
1 19 1978	3256.45	45.55	-00.03
3 7 1978	3256.47	45.53	-00.02
4 12 1978	3256.56	45.44	-00.09
6 6 1978	3258.10	43.90	-01.54
7 8 1978	3256.79	45.21	01.31
8 30 1978	3256.73	45.27	00.06
10 19 1978	3256.75	45.25	-00.02
12 6 1978	3256.68	45.32	00.07
1 30 1979	3256.02	45.98	00.66
6 11 1979	3256.81	45.19	-00.79
7 10 1979	3254.39	47.61	02.42
8 8 1979	3256.75	45.25	-02.36

6-1/2"
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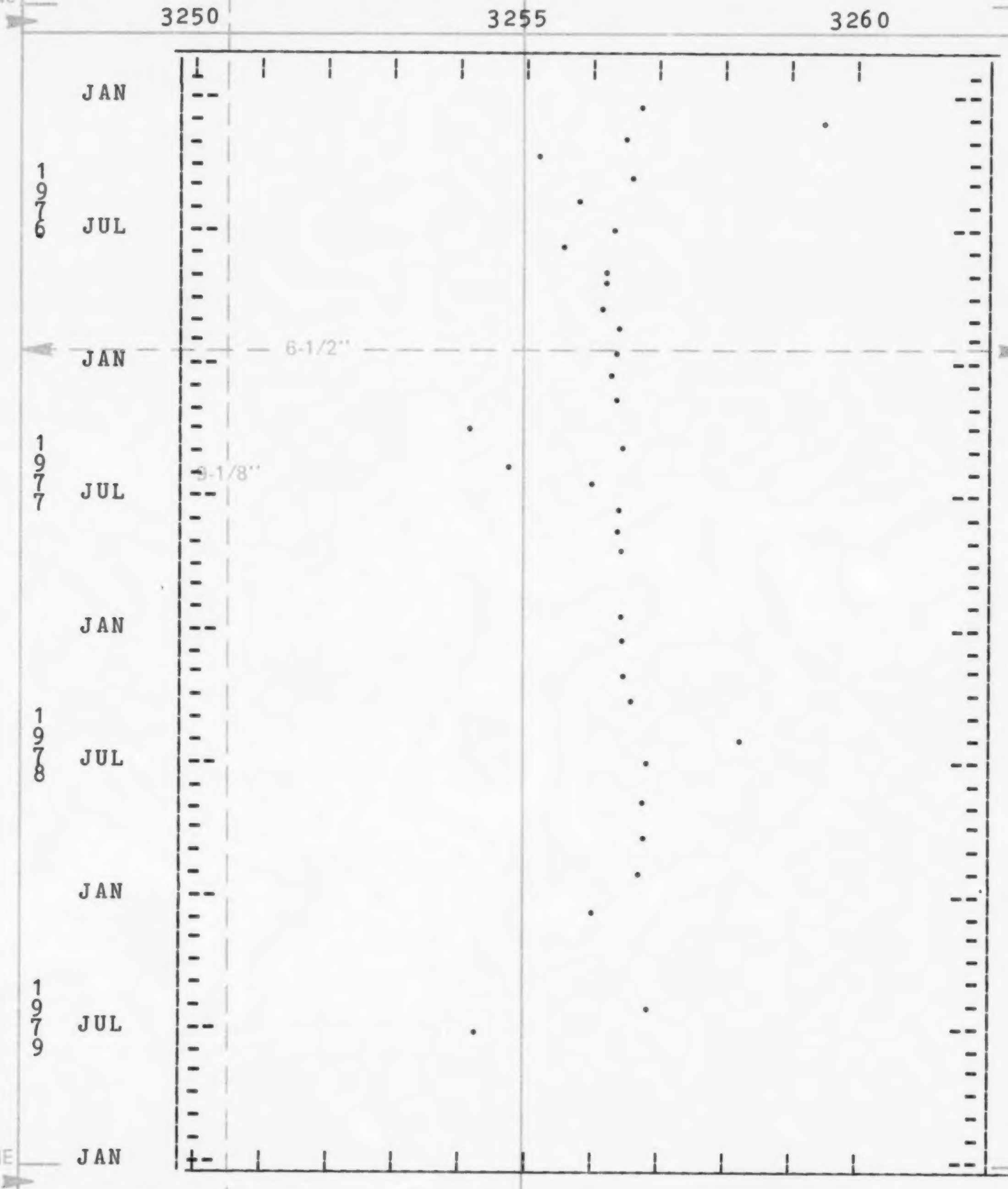
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP11B

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 11B (COAL AQUIFER)

DATE		091576	122176	040477	062077	122077
POTASSIUM	PPM	60.00	16.00	17.00	20.00	22.00
SODIUM	PPM	730	750	780	1000	860
CALCIUM	PPM		7.00	6.00	28.00	12.00
MAGNESIUM	PPM		7.00	2.00	21.00	12.00
SULFATE	PPM	527	540	431	1715	1045
CHLORIDE	PPM	25.00	19.00	19.00	25.00	20.00
CARBONATE	PPM	240	444	648	156	132
BICARBONATE	PPM	224	464	220	366	854
FLOURIDE	PPM	2.90	5.20	6.10	2.30	6.40
SILICON DIO	PPM	60.00	59.00	67.00	44.00	52.00
TOTAL P	PPM	0.13	0.04	0.11	0.19	0.20
NITRATE	PPM	14.00	3.00	0.50	0.20	0.60
POTASSIUM	EPM	1.53	0.41	0.43	0.51	0.56
SODIUM	EPM	31.76	32.62	33.93	43.50	37.41
CALCIUM	EPM		0.35	0.30	1.40	0.60
MAGNESIUM	EPM		0.58	0.16	1.73	0.99
SULFATE	EPM	10.97	11.24	8.97	35.71	21.76
CHLORIDE	EPM	0.71	0.54	0.54	0.71	0.56
CARBONATE	EPM	8.00	14.80	21.60	5.20	4.40
BICARBONATE	EPM	3.67	7.60	3.61	6.00	14.00
FLOURIDE	EPM	0.15	0.27	0.32	0.12	0.34
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		165	33.96	34.83	47.14	39.56
TOTAL ANIONS		23.32	34.32	34.90	47.55	40.91
DEVIATION		14.11	101	100	101	103
TDS (calc.)		1582	2011	2011	3145	2524
TDS @180		1814	2112	2080	3135	2518
TOTAL HARDNESS		0.00	45.00	24.00	156	77.00
ALKALINITY		1060	1120	1260	560	920
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		3500	3300	3300	4220	3724
FIELD COND.						2000
LAB pH			9.90	9.90	9.30	9.20
FIELD pH			9.50			9.40

EPA-287 (Cin.)
(4-76)

WELL NCRP 11B (COAL AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	27.00	16.64	5.00
SODIUM	PPM	824	98.51	5.00
CALCIUM	PPM	13.25	8.81	4.00
MAGNESIUM	PPM	10.50	7.02	4.00
SULFATE	PPM	852	482	5.00
CHLORIDE	PPM	21.60	2.80	5.00
CARBONATE	PPM	324	196	5.00
BICARBONATE	PPM	426	233	5.00
FLOURIDE	PPM	4.58	1.67	5.00
SILICON DIO	PPM	56.40	7.81	5.00
TOTAL P	PPM	0.13	0.06	5.00
NITRATE	PPM	3.66	5.27	5.00
POTASSIUM	EPM	0.69		
SODIUM	EPM	35.84		
CALCIUM	EPM	0.66		
MAGNESIUM	EPM	0.86		
SULFATE	EPM	17.73		
CHLORIDE	EPM	0.61		
CARBONATE	EPM	10.80		
BICARBONATE	EPM	6.98		
FLOURIDE	EPM	0.24		
NITRATE	EPM	0.00		
TOTAL CATIONS		64.16	50.79	5.00
TOTAL ANIONS		36.20	8.03	5.00
DEVIATION		83.93	34.93	5.00
TDS (calc.)		2255	536	5.00
TDS @180		2332	460	5.00
TOTAL HARDNESS		60.40	54.08	5.00
ALKALINITY		984	238	5.00
NON-CARB HARD		0.00	0.00	5.00
LAB CONDUCTIVITY		3609	343	5.00
FIELD COND.		2000	0.00	1.00
LAB pH		9.58	0.33	4.00
FIELD pH		9.45	0.05	2.00

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #16
Date Completed 12/4/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-5'	5'	Clay, Brown
5'-18'	13'	Sandy Gravel, Clinker, H_2O
18'-20'	2'	Sandy Clay
20'-30'	10'	Gravel, Sand

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 16A 1 of 2

DATE		031776	031776	092276	122176	062177
POTASSIUM	PPM	5.00	5.00	20.00	4.00	2.00
SODIUM	PPM	390	390	445	390	440
CALCIUM	PPM	10.00	10.00		4.00	2.00
MAGNESIUM	PPM	3.00	3.00		6.00	1.00
SULFATE	PPM	6.00	6.00	7.00	0.00	13.00
CHLORIDE	PPM	6.00	6.00	21.00	17.00	23.00
CARBONATE	PPM	0.00	0.00	96.00	108	84.00
BICARBONATE	PPM	1098	1098	927	878	915
FLOURIDE	PPM	7.30	7.30	4.00	6.40	7.00
SILICON DIO	PPM	8.00	8.00	8.00	8.00	10.00
TOTAL P	PPM	0.10	0.10	0.02	0.02	0.16
NITRATE	PPM	1.00	1.00	1.00	1.00	0.10
POTASSIUM	EPM	0.13	0.13	0.51	0.10	0.05
SODIUM	EPM	16.96	16.96	19.36	16.96	19.14
CALCIUM	EPM	0.50	0.50		0.20	0.10
MAGNESIUM	EPM	0.25	0.25		0.49	0.08
SULFATE	EPM	0.12	0.12	0.15	0.00	0.27
CHLORIDE	EPM	0.17	0.17	0.59	0.48	0.65
CARBONATE	EPM	0.00	0.00	3.20	3.60	2.80
BICARBONATE	EPM	18.00	18.00	15.19	14.39	15.00
FLOURIDE	EPM	0.38	0.38	0.21	0.34	0.37
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		17.84	17.84	152	17.76	19.37
TOTAL ANIONS		18.63	18.63	19.19	18.68	18.92
DEVIATION		104	104	12.63	105	97.65
TDS (calc.)		961	961	1046	962	1016
TDS @180		1.17	1040	1025	1023	1012
TOTAL HARDNESS		37.00	37.00	0.00	35.00	10.00
ALKALINITY		900	900	920	900	890
NON-CARB HARD		900	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1700	1700	1650	1800	1707
FIELD COND.						
LAB pH		7.30	7.30	9.10	8.40	8.30
FIELD pH		7.80	7.80	7.60	7.50	

WELL NCRP 16A

2 of 2

DATE		101177	MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	7.83	6.09	6.00
SODIUM	PPM	428	414	24.36	6.00
CALCIUM	PPM	2.00	5.60	3.67	5.00
MAGNESIUM	PPM	1.00	2.80	1.83	5.00
SULFATE	PPM	16.00	8.00	5.20	6.00
CHLORIDE	PPM	19.00	15.33	6.85	6.00
CARBONATE	PPM	48.00	56.00	43.63	6.00
BICARBONATE	PPM	1025	990	88.21	6.00
FLOURIDE	PPM	6.20	6.37	1.14	6.00
SILICON DIO	PPM	8.00	8.33	0.75	6.00
TOTAL P	PPM	0.08	0.01	0.09	6.00
NITRATE	PPM	0.10	0.67	0.47	6.00
POTASSIUM	EPM	0.28	0.20		
SODIUM	EPM	18.62	18.00		
CALCIUM	EPM	0.10	0.28		
MAGNESIUM	EPM	0.08	0.23		
SULFATE	EPM	0.33	0.17		
CHLORIDE	EPM	0.54	0.43		
CARBONATE	EPM	1.60	1.87		
BICARBONATE	EPM	16.80	16.23		
FLOURIDE	EPM	0.33	0.34		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		19.08	40.63	49.76	6.00
TOTAL ANIONS		19.46	18.92	0.31	6.00
DEVIATION		102	87.71	33.67	6.00
TDS (calc.)		1030	996	35.74	6.00
TDS @180		1019	853	381	6.00
TOTAL HARDNESS		10.00	21.50	15.22	6.00
ALKALINITY		920	905	11.18	6.00
NON-CARB HARD		0.00	150	335	6.00
LAB CONDUCTIVITY		1617	1696	56.76	6.00
FIELD COND.		1250	1250	0.00	1.00
LAB pH		8.50	8.15	0.65	6.00
FIELD pH			7.67	0.13	4.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP16B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2999

DATE	LEVEL	READING	CHANGE
1 16 1976	2983.60	15.40	00.00
2 8 1976	2983.80	15.20	-00.20
3 1 1976	2983.93	15.07	-00.13
3 17 1976	2983.93	15.07	00.00
4 21 1976	2983.68	15.32	00.25
6 2 1976	2983.99	15.01	-00.31
7 6 1976	2983.47	15.53	00.52
7 27 1976	2984.09	14.91	-00.62
9 2 1976	2983.64	15.36	00.45
9 15 1976	2983.64	15.36	00.00
9 22 1976	2983.63	15.37	00.01
10 20 1976	2983.64	15.36	-00.01
11 18 1976	2983.58	15.42	00.06
12 20 1976	2983.67	15.33	-00.09
1 24 1977	2983.69	15.31	-00.02
2 22 1977	2983.95	15.05	-00.26
4 5 1977	2983.70	15.30	00.25
5 2 1977	2983.94	15.06	-00.24
5 26 1977	2984.40	14.60	-00.46
6 21 1977	2984.62	14.38	-00.22
7 26 1977	2984.38	14.62	00.24
8 23 1977	2984.18	14.82	00.20
10 11 1977	2983.89	15.11	00.29
1 12 1978	2983.69	15.31	00.20
1 20 1978	2983.74	15.26	-00.05
3 7 1978	2983.93	15.07	-00.19
4 11 1978	2984.72	14.28	-00.79
6 14 1978	2987.17	11.83	-02.45
7 8 1978	2986.97	12.03	00.20
8 31 1978	2985.55	13.45	01.42
10 19 1978	2984.75	14.25	00.80
12 6 1978	2984.28	14.72	00.47
1 10 1979	2984.62	14.38	-00.34
2 8 1979	2984.85	14.15	-00.23
3 6 1979	2985.31	13.69	-00.46
6 7 1979	2984.88	14.12	00.43
7 13 1979	2984.60	14.40	00.28
8 7 1979	2984.21	14.79	00.39
9 7 1979	2984.19	14.81	00.02
10 5 1979	2984.07	14.93	00.12

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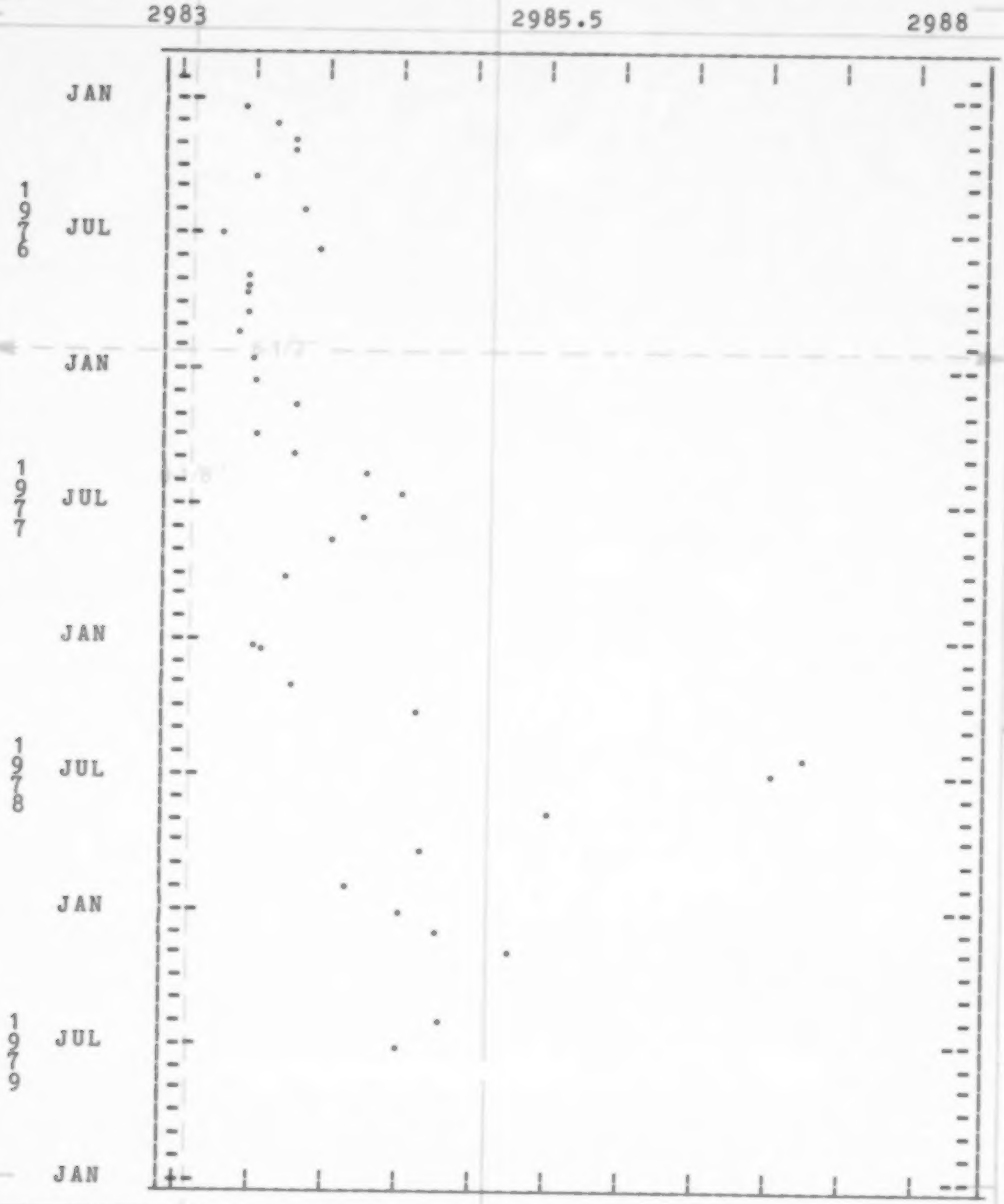
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP16B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 16B (UNCONSOLIDATED) 1 of 2

DATE		021076	031776	070676	092276	122176
POTASSIUM	PPM	11.00	11.00	25.00	15.00	11.00
SODIUM	PPM	230	240	240	270	220
CALCIUM	PPM	41.00	60.00	54.00	118	46.00
MAGNESIUM	PPM	31.00	55.00	51.00	8.00	42.00
SULFATE	PPM	352	442	420	422	7.00
CHLORIDE	PPM	14.00	6.00	9.00	13.00	7.00
CARBONATE	PPM	9.00	0.00	72.00	0.00	537
BICARBONATE	PPM	470	543	390	549	923
FLOURIDE	PPM	0.80	0.90	0.90	0.90	1.10
SILICON DIO	PPM	17.00	12.00	19.00	23.00	24.00
TOTAL P	PPM	0.12	0.10	0.10	0.06	0.13
NITRATE	PPM	1.00	1.00	1.00	1.00	1.00
POTASSIUM	EPM	0.28	0.28	0.64	0.38	0.28
SODIUM	EPM	10.00	10.44	10.44	11.74	9.57
CALCIUM	EPM	2.05	2.99	2.69	5.89	2.30
MAGNESIUM	EPM	2.55	4.52	4.20	0.66	3.45
SULFATE	EPM	7.33	9.20	8.74	8.79	0.15
CHLORIDE	EPM	0.39	0.17	0.25	0.37	0.20
CARBONATE	EPM	0.30	0.00	2.40	0.00	17.90
BICARBONATE	EPM	7.70	8.90	6.39	9.00	15.13
FLOURIDE	EPM	0.04	0.05	0.05	0.05	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.88	18.24	17.97	18.67	15.60
TOTAL ANIONS		15.67	18.27	17.77	18.10	33.38
DEVIATION		105	100	98.91	96.94	214
TDS (calc.)		919	1081	1063	1116	932
TDS @180		958	1120	1133	1063	0.95
TOTAL HARDNESS		231	377	344	329	287
ALKALINITY		385	445	440	450	440
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1400	1700	1800	1400	1500
FIELD COND.						
LAB pH		8.00	8.10	8.40	7.80	7.90
FIELD pH		7.30	7.20	6.70	6.80	7.60

PAGE NUMBER
EPA 287 (Cin.)
(4-76)

WELL NCRP 16B (UNCONSOLIDATED) 2 of 2

DATE		122176	062177	MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	12.00	13.71	4.80	7.00
SODIUM	PPM	220	280	243	21.85	7.00
CALCIUM	PPM	46.00	75.00	62.86	24.84	7.00
MAGNESIUM	PPM	42.00	44.00	39.00	14.48	7.00
SULFATE	PPM	333	558	362	160	7.00
CHLORIDE	PPM	7.00	11.00	9.57	2.92	7.00
CARBONATE	PPM	0.00	0.00	88.29	185	7.00
BICARBONATE	PPM	537	525	562	156	7.00
FLOURIDE	PPM	1.10	1.00	0.96	0.10	7.00
SILICON DIO	PPM	24.00	28.00	21.00	4.96	7.00
TOTAL P	PPM	0.13	0.22	0.09	0.09	7.00
NITRATE	PPM	1.00	0.10	0.27	0.89	7.00
POTASSIUM	EPM	0.28	0.31	0.35		
SODIUM	EPM	9.57	12.18	10.56		
CALCIUM	EPM	2.30	3.74	3.14		
MAGNESIUM	EPM	3.45	3.62	3.21		
SULFATE	EPM	6.93	11.62	7.54		
CHLORIDE	EPM	0.20	0.31	0.27		
CARBONATE	EPM	0.00	0.00	2.94		
BICARBONATE	EPM	8.80	8.60	9.22		
FLOURIDE	EPM	0.06	0.05	0.05		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		15.60	19.85	17.26	1.75	7.00
TOTAL ANIONS		15.94	20.51	19.95	5.68	7.00
DEVIATION		102	103	117	39.56	7.00
TDS (calc.)		923	1238	1039	112	7.00
TDS @180		932	1205	916	384	7.00
TOTAL HARDNESS		287	366	317	47.91	7.00
ALKALINITY		440	430	433	20.33	7.00
NON-CARB HARD		0.00	0.00	0.00	0.00	7.00
LAB CONDUCTIVITY		1500	1756	1579	156	7.00
FIELD COND.				0.00	0.00	0.00
LAB pH		7.90	7.80	7.99	0.20	7.00
FIELD pH		7.60		7.20	0.35	6.00

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
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9-1/8"

LITHOLOGIC LOG

Well # NCRP #32A
Date Completed 7/25/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-13'	13'	Sandstone, Burned, Orange Loose at top
13'-17'	4'	Shale, Hard, Burned, Tan
17'-20'	3'	Sandstone, Hard, Burned Brick Red
20'-23'	3'	Sandstone and Shale, Hard Partly Burned, Tan
23'-38'	15'	Clinker, Orange to Tan to White to Brick Red, No cuttings 30-38'
38'-51'	13'	Sandstone, Burned, Fine, Brick Orange, Drills Easily
51'-57'	6'	Clinker? - Hard Drillings Losing Air and Cuttings to Formation
57'-82'	25'	Easier Drilling But Few Cuttings, Sandstone, Burnt Orange
82'-93'	11'	Clinker, Hard, Steel Casing put to 86.5'
93'-97'	3'	Sandstone, Lighter Orange
97'-120'	23'	Clinker, Brick-Red, Hard, Flinty, Hard Drilling, Burnt Orange, Shale and Sandstone 105'

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3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

#32A continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
120'-130'	10'	Few Cuttings, Those Present Indicate Burned Shale and Sand, Shale and Blackish Purple Flinty Rock. (Blackish Purple)
130'-132'	2'	Losing Air to Formation - Burned (D'-132')
132'-139'	7'	Knobloch Coal, Shale Partings, Damp, H_2O (Very Little No Loose Water But Wet Clay and Coal)
139'-144'	5'	Sandstone, Fine Gray, Damp, Interbeds of Smutty Brown, Coaley Shale Below 140
144'-146'	2'	Shale, Light Gray

EPA-287 (Cin.)
(4-76)

WELL NCRP32

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3180

DATE	LEVEL	READING	CHANGE
7 27 1976	3094.30	85.70	00.00
7 28 1976	3053.52	126.48	40.78
9 2 1976	3053.09	126.91	00.43
9 15 1976	3053.42	126.58	-00.33
10 20 1976	3053.36	126.64	00.06
11 18 1976	3052.96	127.04	00.40
12 21 1976	3053.04	126.96	-00.08
1 3 1977	3053.28	126.72	-00.24
1 21 1977	3053.39	126.61	-00.11
3 2 1977	3053.05	126.95	00.34
4 5 1977	3053.00	127.00	00.05
5 3 1977	3053.15	126.85	-00.15
5 26 1977	3053.05	126.95	00.10
6 22 1977	3053.12	126.88	-00.07
7 26 1977	3053.02	126.98	00.10
8 23 1977	3053.05	126.95	-00.03
1 20 1978	3051.99	128.01	01.06
3 7 1978	3053.03	126.97	-01.04
4 11 1978	3053.40	126.60	-00.37
6 14 1978	3054.00	126.00	-00.60
7 8 1978	3053.41	126.59	00.59
8 30 1978	3053.43	126.57	-00.02
10 19 1978	3053.39	126.61	00.04
6 18 1979	3053.76	126.24	-00.37
7 13 1979	3053.66	126.34	00.10

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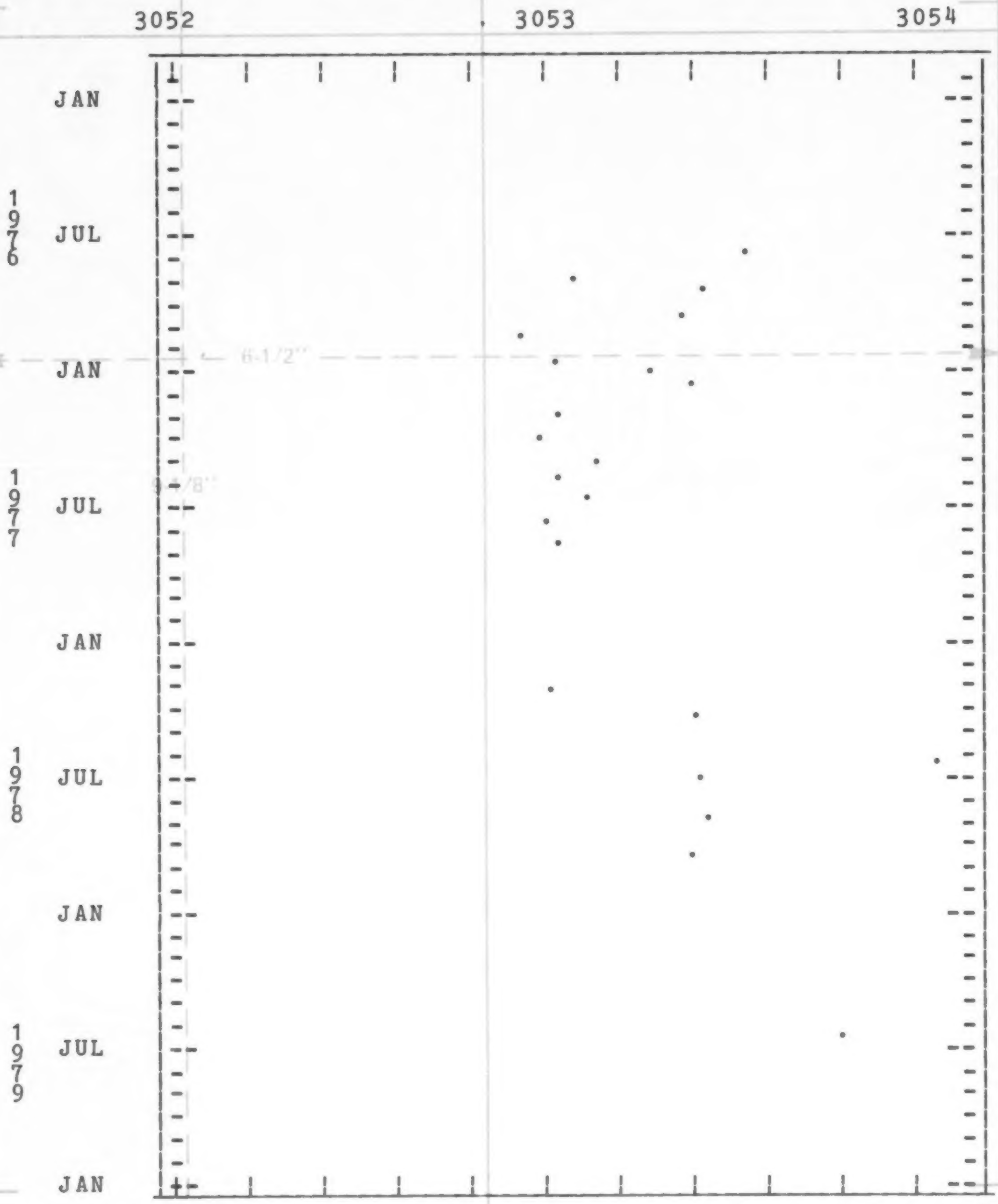
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP32



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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 32 1 of 2

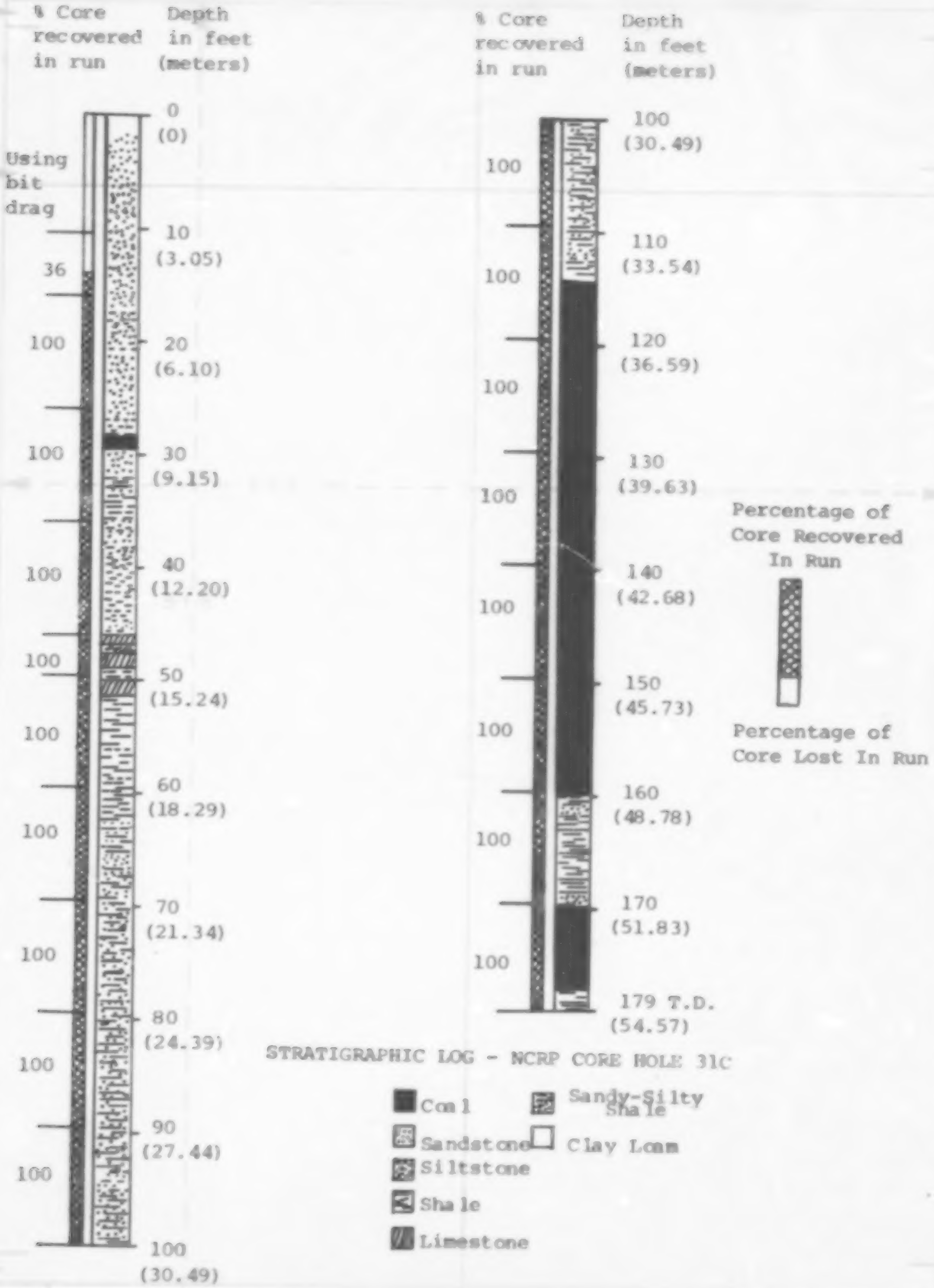
DATE		091576	122176	040577	062277	062277
POTASSIUM	PPM	50.00	38.00	41.00	40.00	40.00
SODIUM	PPM	665	670	720	700	700
CALCIUM	PPM	140	108	105	114	114
MAGNESIUM	PPM	72.00	86.00	89.00	125	125
SULFATE	PPM	1871	1835	1901	1982	1982
CHLORIDE	PPM	42.00	40.00	39.00	44.00	44.00
CARBONATE	PPM	12.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	156	153	171	354	354
FLOURIDE	PPM	1.20	1.20	1.30	1.50	1.50
SILICON DIO	PPM	27.00	16.00	16.00	17.00	17.00
TOTAL P	PPM	0.04	0.01	0.03	0.02	0.02
NITRATE	PPM	1.00	1.00	0.10	0.10	0.10
POTASSIUM	EPM	1.28	0.97	1.05	1.02	1.02
SODIUM	EPM	28.93	29.15	31.32	30.45	30.45
CALCIUM	EPM	6.99	5.39	5.24	5.69	5.69
MAGNESIUM	EPM	5.92	7.07	7.32	10.28	10.28
SULFATE	EPM	38.95	38.20	39.58	41.27	41.27
CHLORIDE	EPM	1.18	1.13	1.10	1.24	1.24
CARBONATE	EPM	0.40	0.00	0.00	0.00	0.00
BICARBONATE	EPM	2.56	2.51	2.80	5.80	5.80
FLOURIDE	EPM	0.06	0.06	0.07	0.08	0.08
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		43.11	42.58	44.93	47.44	47.44
TOTAL ANIONS		42.85	41.61	43.26	48.06	48.06
DEVIATION		99.38	97.72	96.29	101	101
TDS (calc.)		2929	2852	2979	3179	3179
TDS @180		2818	2984	2922	3167	3167
TOTAL HARDNESS		645	624	623	800	800
ALKALINITY		148	125	140	290	290
NON-CARB HARD		497	499	488	510	510
LAB CONDUCTIVITY		3600	3900	3900	3977	3977
FIELD COND.						
LAB pH		8.90	7.60	7.50	7.70	7.70
FIELD pH		7.40	6.30	7.10		

EPA-287 (Cin.)
(4-76)

WELL NCRP 32 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	41.80	4.21	5.00
SODIUM	PPM	691	20.59	5.00
CALCIUM	PPM	116	12.40	5.00
MAGNESIUM	PPM	99.40	21.68	5.00
SULFATE	PPM	1914	59.19	5.00
CHLORIDE	PPM	41.80	2.04	5.00
CARBONATE	PPM	2.40	4.80	5.00
BICARBONATE	PPM	238	95.24	5.00
FLOURIDE	PPM	1.34	0.14	5.00
SILICON DIO	PPM	18.60	4.22	5.00
TOTAL P	PPM	0.02	0.02	5.00
NITRATE	PPM	0.38	0.51	5.00
POTASSIUM	EPM	1.07		
SODIUM	EPM	30.06		
CALCIUM	EPM	5.80		
MAGNESIUM	EPM	8.18		
SULFATE	EPM	39.85		
CHLORIDE	EPM	1.18		
CARBONATE	EPM	0.08		
BICARBONATE	EPM	3.89		
FLOURIDE	EPM	0.07		
NITRATE	EPM	0.00		
TOTAL CATIONS		45.10	2.06	5.00
TOTAL ANIONS		44.77	2.74	5.00
DEVIATION		99.20	1.98	5.00
TDS (calc.)		3024	133	5.00
TDS @180		3012	138	5.00
TOTAL HARDNESS		698	83.33	5.00
ALKALINITY		199	74.99	5.00
NON-CARB HARD		501	8.38	5.00
LAB CONDUCTIVITY		3871	140	5.00
FIELD COND.		0.00	0.00	0.00
LAB pH		7.88	0.52	5.00
FIELD pH		6.93	0.46	3.00

EPA-287 (Cin.)
(4-76)


% Core recovered in run
Depth in feet (meters)
Using bit drag
36
100
0 (0)
10 (3.05)
20 (6.10)
30 (9.15)
40 (12.20)
50 (15.24)
60 (18.29)
70 (21.34)
80 (24.39)
90 (27.44)
100 (30.49)
% Core recovered in run
Depth in feet (meters)
100 (30.49)
110 (33.54)
120 (36.59)
130 (39.63)
140 (42.68)
150 (45.73)
160 (48.78)
170 (51.83)
179 T.D. (54.57)
Percentage of Core Recovered In Run
Percentage of Core Lost In Run
Coal
Sandstone
Siltstone
Shale
Limestone
Sandy-Silty Shale
Clay Loam

STRATIGRAPHIC LOG - NCRP CORE HOLE 31C

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TOP OF IMAGE AREA

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WELL NCRP31C

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3220

DATE	LEVEL	READING	CHANGE
10 20 1976	3093.62	126.38	00.00
11 18 1976	3093.26	126.74	00.36
12 21 1976	3093.49	126.51	-00.23
1 21 1977	3093.28	126.72	00.21
3 2 1977	3093.05	126.95	00.23
4 5 1977	3093.20	126.80	-00.15
5 3 1977	3093.65	126.35	-00.45
5 26 1977	3093.43	126.57	00.22
6 22 1977	3093.53	126.47	-00.10
7 26 1977	3093.33	126.67	00.20
8 23 1977	3093.41	126.59	-00.08
11 10 1977	3093.20	126.80	00.21
12 21 1977	3094.65	125.35	-01.45
1 20 1978	3093.40	126.60	01.25
3 7 1978	3093.19	126.81	00.21
4 6 1978	3093.75	126.25	-00.56
6 14 1978	3093.47	126.53	00.28
7 8 1978	3093.22	126.78	00.25
8 30 1978	3093.28	126.72	-00.06
10 19 1978	3093.18	126.82	00.10
5 30 1979	3094.10	125.90	-00.92
6 18 1979	3093.61	126.39	00.49
7 13 1979	3093.21	126.79	00.40

6-1/2"

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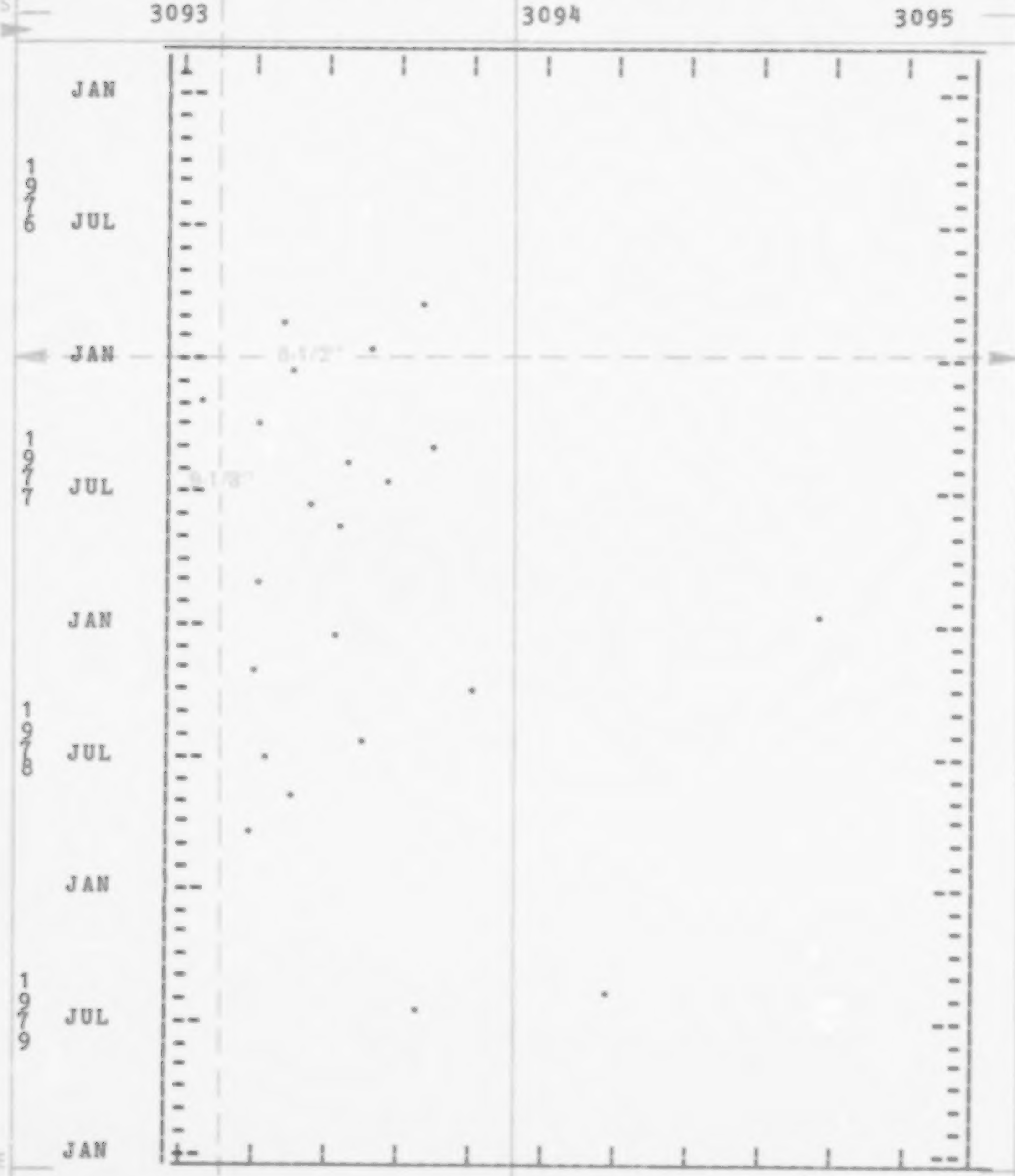
BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

HYDROGRAPH FOR WELL NCRP31C



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3/8"

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well # NCRP #30A
Date Completed 7/21/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-16'	16'	Silty, Sand, Tan, Fine, Soft
16'-17'	1'	Gravelly Silt
17'-29'	12'	Shale, Soft, Reddish-Brown Brick, Soft
29'-35'	6'	Siltstone, Very Fine, Dark Red Brick, Soft
35'-37'	2'	Siltstone,Very Fine, Whitish, Tan, Soft
37'-46'	9'	Hard Layer Sandstone, Tan to Reddish, Burned?
46'-58'	12'	Sandstone, Reddish-Brown, Fine to Silty, Drills Rough
58'-87'	29'	Hard Layer Clinker (Sandstone?) Brick Red, went down to 80' w/8" Hole Rig losing air to formation - loose clinker, No cutting
87'-91'	4'	Grayish to Reddish Flinty Fractured Rock and Sandstone Hard, Tan H_2O at 87' 2 gal./min.
91'-118'	27'	Coal - at 100' Clinker Started Caving in ' Steel Casing down to 93'
118'-124'	6'	Silty Shale, Gray, H_2O at Base of Coal

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PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP30

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3080

DATE	LEVEL	READING	CHANGE
7 27 1976	2994.30	85.70	00.00
9 9 1976	2994.74	85.26	-00.44
9 16 1976	2994.68	85.32	00.06
10 20 1976	2994.85	85.15	-00.17
11 7 1976	2994.62	85.38	00.23
12 21 1976	2994.50	85.50	00.12
1 21 1977	2994.45	85.55	00.05
3 2 1977	2994.39	85.61	00.06
4 5 1977	2994.00	86.00	00.39
5 3 1977	2994.17	85.83	-00.17
5 26 1977	2993.96	86.04	00.21
6 21 1977	2993.90	86.10	00.06
7 26 1977	2993.96	86.04	-00.06
8 23 1977	2993.88	86.12	00.08
11 8 1977	2995.16	84.84	-01.28
1 3 1978	2993.87	86.13	01.29
1 20 1978	2996.28	83.72	-02.41
3 7 1978	2993.56	86.44	02.72
4 6 1978	2993.58	86.42	-00.02
6 6 1978	2993.94	86.06	-00.36
7 8 1978	2993.86	86.14	00.08
8 30 1978	2993.80	86.20	00.06
10 3 1978	2993.80	86.20	00.00
10 19 1978	2993.78	86.22	00.02
12 6 1978	2993.90	86.10	-00.12
1 10 1979	2993.95	86.05	-00.05
2 8 1979	2993.83	86.17	00.12
3 9 1979	2993.79	86.21	00.04
3 30 1979	2993.83	86.17	-00.04
4 19 1979	2993.93	86.07	-00.10
6 12 1979	2994.68	85.32	-00.75
7 12 1979	2994.65	85.35	00.03
8 7 1979	2994.06	85.94	00.59
10 19 1979	2994.24	85.76	-00.18

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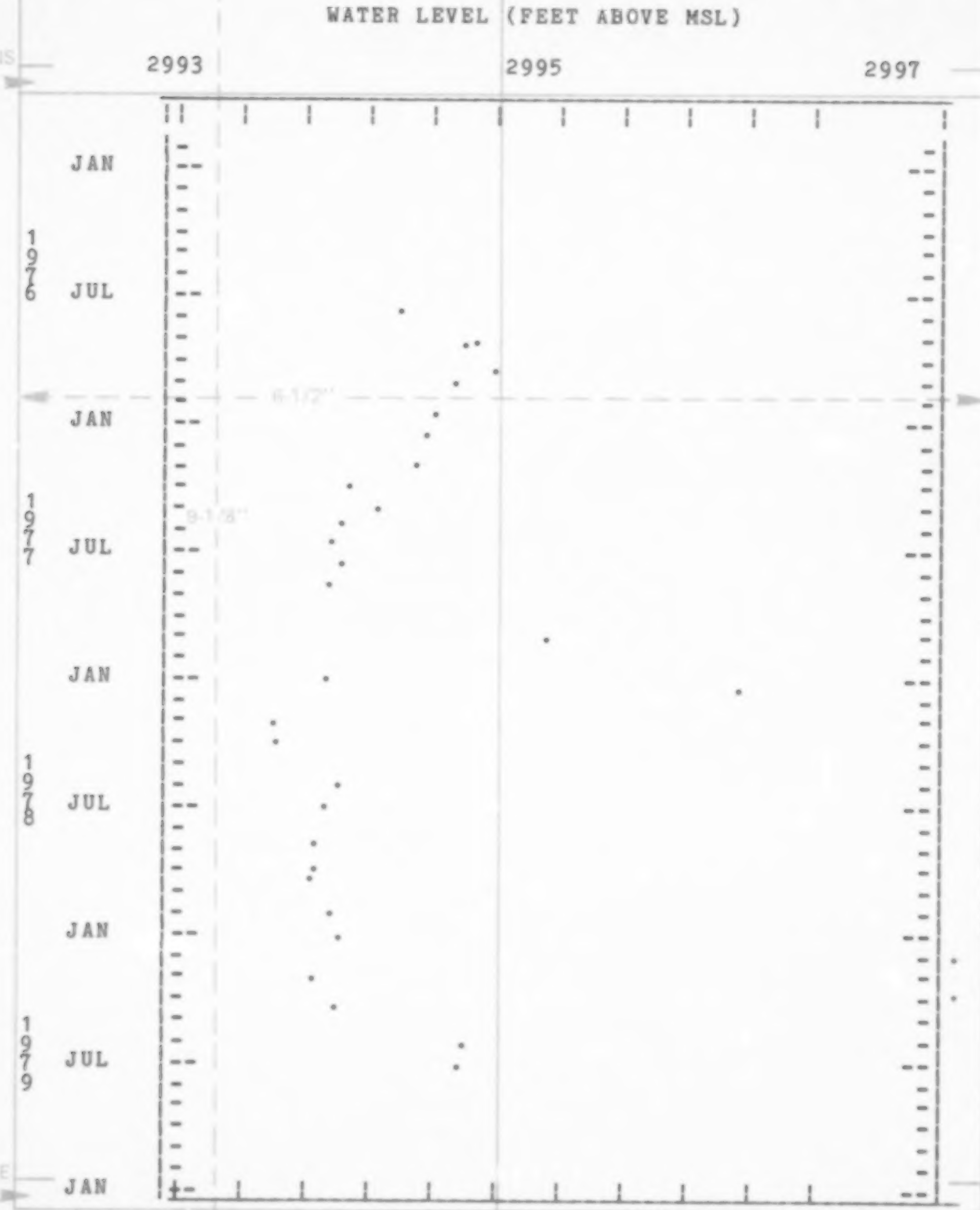
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP30



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EPA-287 (Cin.)
(4-76)

WELL NCRP 30A 1 of 2

DATE		070876	091676	091676	122176	040577
POTASSIUM	PPM	14.00	10.00		10.00	11.00
SODIUM	PPM	411	145		140	140
CALCIUM	PPM	135	110		86.00	94.00
MAGNESIUM	PPM	88.00	29.00		43.00	37.00
SULFATE	PPM	1357	197		195	203
CHLORIDE	PPM	14.00	13.00		8.00	7.00
CARBONATE	PPM	0.00	0.00		0.00	0.00
BICARBONATE	PPM	268	573		573	774
FLOURIDE	PPM	0.40	0.50		0.60	0.53
SILICON DIO	PPM	19.00	28.00	28.00	28.00	28.00
TOTAL P	PPM	0.04	0.05		0.02	0.09
NITRATE	PPM	1.00	1.00		1.00	0.10
POTASSIUM	EPM	0.36	0.26		0.26	0.28
SODIUM	EPM	17.88	6.31		6.09	6.09
CALCIUM	EPM	6.74	5.49		4.29	4.69
MAGNESIUM	EPM	7.24	2.39		3.54	3.04
SULFATE	EPM	28.25	4.10		4.06	4.23
CHLORIDE	EPM	0.39	0.37		0.23	0.20
CARBONATE	EPM	0.00	0.00		0.00	0.00
BICARBONATE	EPM	4.39	9.39		9.39	12.69
FLOURIDE	EPM	0.02	0.03		0.03	0.03
NITRATE	EPM	0.00	0.00		0.00	0.00
TOTAL CATIONS		32.21	14.44	201	14.17	14.11
TOTAL ANIONS		32.96	13.79	160	13.65	17.09
DEVIATION		102	95.52	79.57	96.30	121
TDS (calc.)		2151	786		764	766
TDS @180		2147	776		796	766
TOTAL HARDNESS		700	393		392	387
ALKALINITY		220	470		470	470
NON-CARB HARD		480	0.00		0.00	0.00
LAB CONDUCTIVITY		2900	1000		1300	1240
FIELD COND.						
LAB pH		8.20	7.60		7.10	7.30
FIELD pH		7.50	6.10	6.10	6.80	6.50

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 30A 2 of 2

DATE		040577	062177	MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	11.00	11.17	1.34	6.00
SODIUM	PPM	140	117	182	103	6.00
CALCIUM	PPM	94.00	89.00	101	16.85	6.00
MAGNESIUM	PPM	37.00	46.00	46.67	19.24	6.00
SULFATE	PPM	203	192	391	432	6.00
CHLORIDE	PPM	7.00	9.00	9.67	2.81	6.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	6.00
BICARBONATE	PPM	573	573	556	148	6.00
FLOURIDE	PPM	0.53	0.45	0.50	0.06	6.00
SILICON DIO	PPM	28.00	33.00	27.43	3.85	7.00
TOTAL P	PPM	0.09	0.33	0.10	0.10	6.00
NITRATE	PPM	0.10	0.10	0.22	0.68	6.00
POTASSIUM	EPM	0.28	0.28	0.29		
SODIUM	EPM	6.09	5.09	7.92		
CALCIUM	EPM	4.69	4.44	5.06		
MAGNESIUM	EPM	3.04	3.78	3.84		
SULFATE	EPM	4.23	4.00	8.14		
CHLORIDE	EPM	0.20	0.25	0.27		
CARBONATE	EPM	0.00	0.00	0.00		
BICARBONATE	EPM	9.39	9.39	9.11		
FLOURIDE	EPM	0.03	0.02	0.03		
NITRATE	EPM	0.00	0.01	0.00		
TOTAL CATIONS		14.11	13.60	43.38	64.66	7.00
TOTAL ANIONS		13.79	13.61	37.84	50.28	7.00
DEVIATION		97.78	100	98.96	11.34	7.00
TDS (calc.)		774	746	998	516	6.00
TDS @180		766	796	1008	510	6.00
TOTAL HARDNESS		387	410	445	114	6.00
ALKALINITY		470	470	428	93.17	6.00
NON-CARB HARD		0.00	0.00	80.00	179	6.00
LAB CONDUCTIVITY		1240	1436	1519	631	6.00
FIELD COND.				0.00	0.00	0.00
LAB pH		7.30	7.40	7.48	0.35	6.00
FIELD pH		6.50		6.58	0.48	6.00

EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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CENTER OF PAGE
TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG

Well: NCRP #8
Date Completed 3/19/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-3'	3'	Clay, Gravel, Brown
3'-14'	11'	Sandy Gravel, Brown, Water
14'-25'	11'	Sandy Gravel, Brown, Water
25'-28'	3'	Clay, Sand, Brown
28'-33'	5'	Sandstone, Brown
33'-33.5'	.5'	Sandstone, Gray
33.5'-40'	6.5'	Sandy Shale, Brown
40'-52'	12'	Sandy Stone, Brown
52'-55'	3'	Shale, Gray
55'-56'	1'	Shale, Gray
56'-66'	10'	Shale, Blue, Gray
66'-67'	1'	Sandstone
67'-109'	42'	Sandy, Shale, Blue, Gray
95'	0	Water
109'-110'	1'	Hard Sandstone, Brown, Fine
110'-140'	30'	Clay Sandstone, Brown, Fine
140'-186'	46	Coal, Water

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

1 of 1

WELL NCRP8A

GROUNDWATER LEVELS (FEET--DATUM MSL)

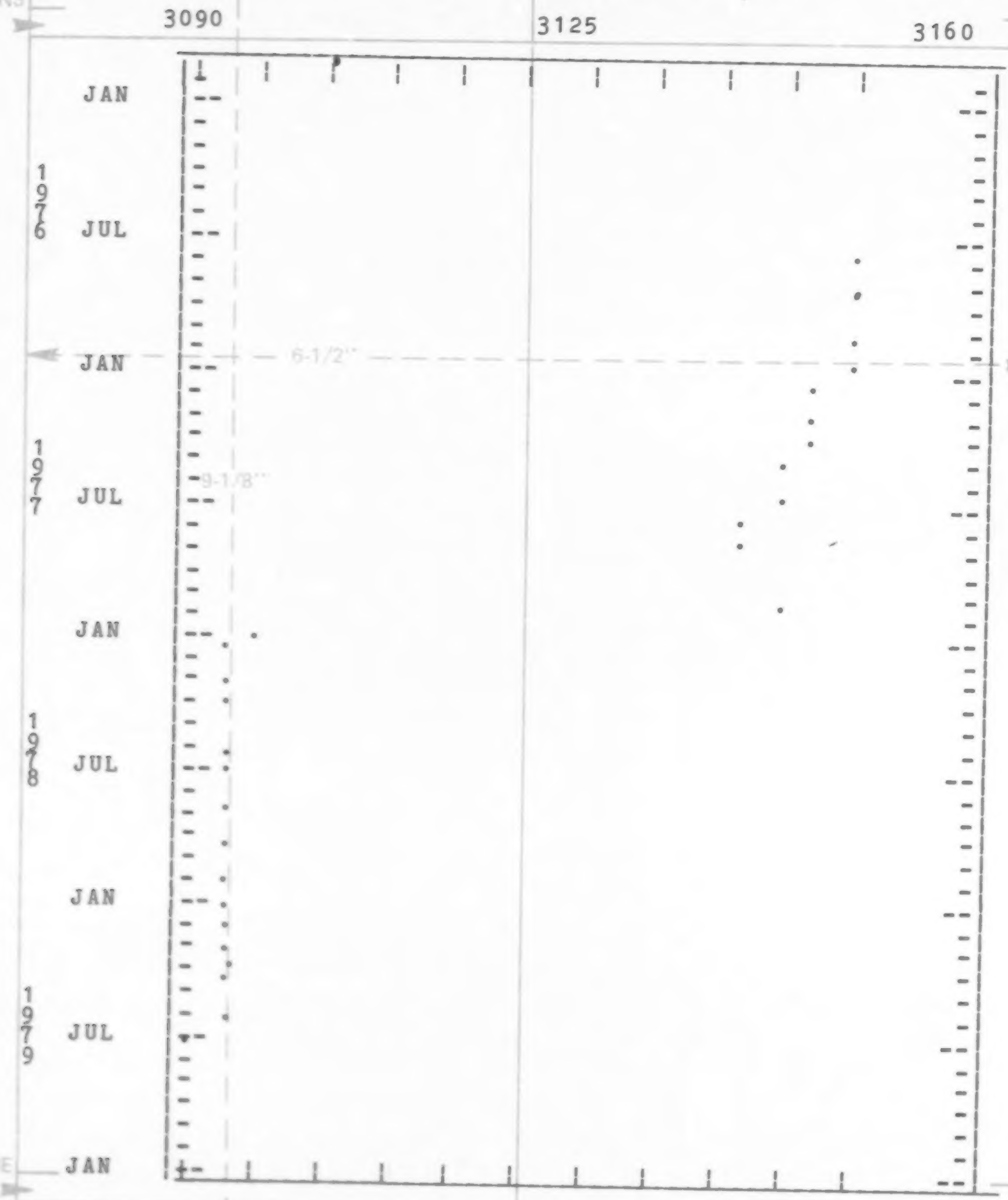
elevation at top of well casing is 3180

DATE	LEVEL	READING	CHANGE
7 27 1976	3154.84	25.16	00.00
9 9 1976	3154.93	25.07	-00.09
9 16 1976	3154.79	25.21	00.14
11 17 1976	3154.74	25.26	00.05
12 21 1976	3154.70	25.30	00.04
1 21 1977	3150.72	29.28	03.98
3 2 1977	3150.66	29.34	00.06
4 5 1977	3150.65	29.35	00.01
5 3 1977	3147.99	32.01	02.66
6 21 1977	3147.94	32.06	00.05
7 26 1977	3143.94	36.06	04.00
8 23 1977	3143.90	36.10	00.04
11 17 1977	3147.94	32.06	-04.04
1 3 1978	3096.11	83.89	51.83
1 20 1978	3093.50	86.50	02.61
3 7 1978	3093.60	86.40	-00.10
4 6 1978	3093.63	86.37	-00.03
6 14 1978	3093.74	86.26	-00.11
7 8 1978	3093.80	86.20	-00.06
8 31 1978	3093.80	86.20	00.00
10 19 1978	3093.75	86.25	00.05
12 6 1978	3093.61	86.39	00.14
1 10 1979	3093.79	86.21	-00.18
2 8 1979	3093.87	86.13	-00.08
3 9 1979	3093.90	86.10	-00.03
3 30 1979	3094.37	85.63	-00.47
4 19 1979	3093.91	86.09	00.46
6 12 1979	3094.09	85.91	-00.18
7 12 1979	3090.11	89.89	03.98
8 7 1979	3094.30	85.70	-04.19
10 19 1979	3094.35	85.65	-00.05

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP8A

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 8A

DATE		070776	122176	040577	062177	110777
POTASSIUM	PPM	9.00	9.00	9.00	8.00	8.00
SODIUM	PPM	474	455	500	490	470
CALCIUM	PPM	18.00	12.00	16.00	14.00	12.00
MAGNESIUM	PPM	8.00	12.00	7.00	11.00	10.00
SULFATE	PPM	504	472	454	482	481
CHLORIDE	PPM	12.00	10.00	11.00	12.00	11.00
CARBONATE	PPM	0.00	0.00	24.00	24.00	24.00
BICARBONATE	PPM	732	732	732	695	720
FLOURIDE	PPM	1.10	1.10	2.20	2.50	2.20
SILICON DIO	PPM	10.00	27.00	14.00	13.00	12.00
TOTAL P	PPM	0.02	0.01	0.06	0.12	0.01
NITRATE	PPM	1.00	1.00	0.20	0.10	0.10
POTASSIUM	EPM	0.23	0.23	0.23	0.20	0.20
SODIUM	EPM	20.62	19.79	21.75	21.32	20.44
CALCIUM	EPM	0.90	0.60	0.80	0.70	0.60
MAGNESIUM	EPM	0.66	0.99	0.58	0.90	0.82
SULFATE	EPM	10.49	9.83	9.45	10.04	10.01
CHLORIDE	EPM	0.34	0.28	0.31	0.34	0.31
CARBONATE	EPM	0.00	0.00	0.80	0.80	0.80
BICARBONATE	EPM	12.00	12.00	12.00	11.39	11.80
FLOURIDE	EPM	0.06	0.06	0.12	0.13	0.12
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		22.41	21.61	23.35	23.12	22.07
TOTAL ANIONS		22.80	22.09	22.60	22.61	22.96
DEVIATION		102	102	96.75	97.78	104
TDS (calc.)		1386	1331	1382	1383	1371
TDS @180		1347	1373	1354	1352	1356
TOTAL HARDNESS		79.00	79.00	68.00	78.00	72.00
ALKALINITY		600	600	640	610	630
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		2700	2150	2150	2105	2058
FIELD COND.						1500
LAB pH		8.10	8.20	8.40	8.30	8.40
FIELD pH		7.60	8.90	7.90		7.30

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 8A 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	8.60	0.49	5.00
SODIUM	PPM	478	15.73	5.00
CALCIUM	PPM	14.40	2.33	5.00
MAGNESIUM	PPM	9.60	1.85	5.00
SULFATE	PPM	479	16.19	5.00
CHLORIDE	PPM	11.20	0.75	5.00
CARBONATE	PPM	14.40	11.76	5.00
BICARBONATE	PPM	722	14.37	5.00
FLOURIDE	PPM	1.82	0.60	5.00
SILICON DIO	PPM	15.20	6.05	5.00
TOTAL P	PPM	0.04	0.05	5.00
NITRATE	PPM	0.00	0.64	5.00
POTASSIUM	EPM	0.22		
SODIUM	EPM	20.78		
CALCIUM	EPM	0.72		
MAGNESIUM	EPM	0.79		
SULFATE	EPM	9.96		
CHLORIDE	EPM	0.32		
CARBONATE	EPM	0.48		
BICARBONATE	EPM	11.84		
FLOURIDE	EPM	0.10		
NITRATE	EPM	0.00		
TOTAL CATIONS		22.51	0.65	5.00
TOTAL ANIONS		22.61	0.29	5.00
DEVIATION		101	2.77	5.00
TDS (calc.)		1371	20.45	5.00
TDS @180		1356	8.83	5.00
TOTAL HARDNESS		75.20	4.45	5.00
ALKALINITY		616	16.25	5.00
NON-CARB HARD		0.00	0.00	5.00
LAB CONDUCTIVITY		2233	236	5.00
FIELD COND.		1500	0.00	1.00
LAB pH		8.28	0.12	5.00
FIELD pH		7.92	0.60	4.00

EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP8B

GROUNDWATER LEVELS (FEET--DATUM MSL)

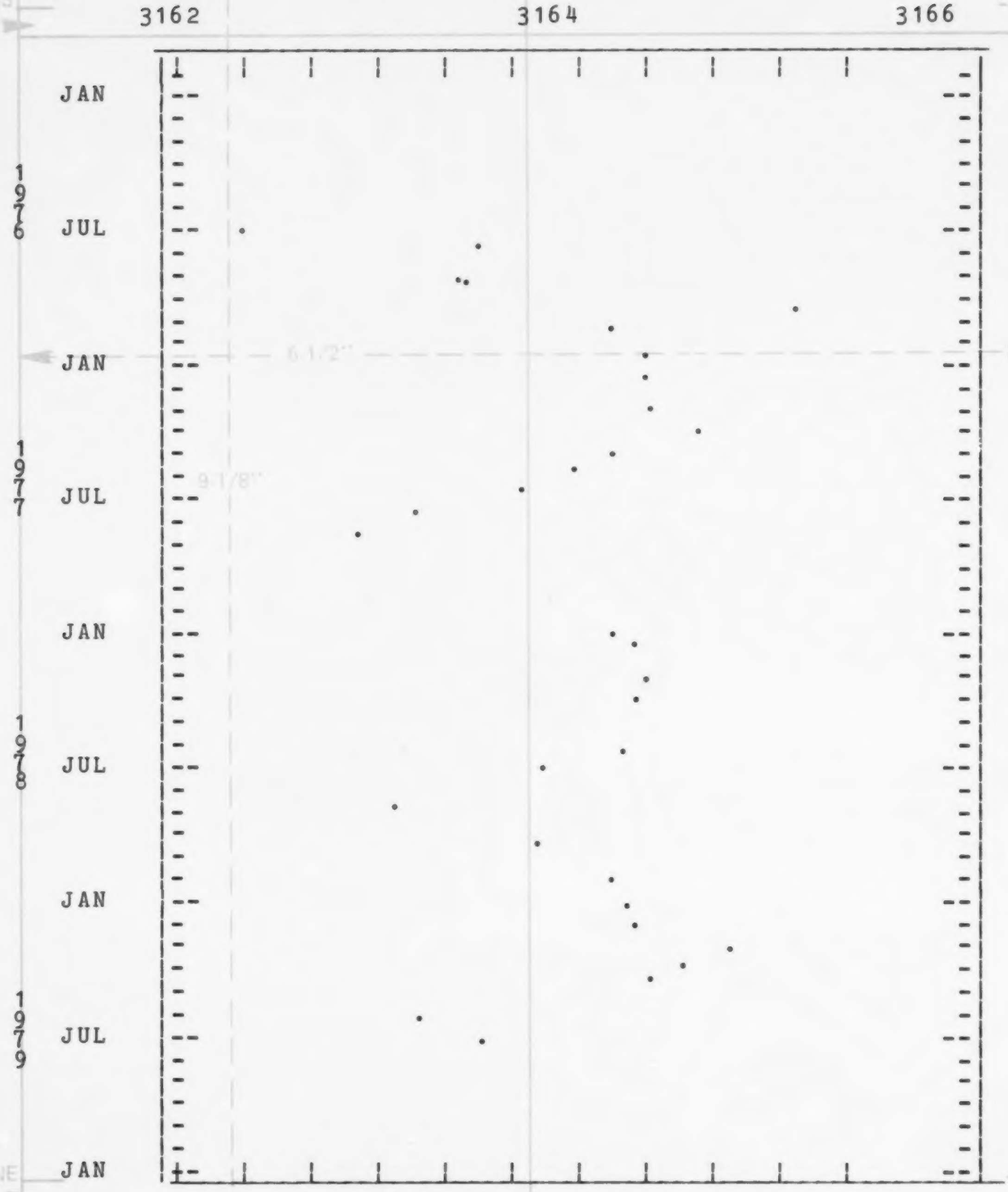
elevation at top of well casing is 3180

DATE	LEVEL	READING	CHANGE
7 7 1976	3162.37	17.63	00.00
7 27 1976	3163.68	16.32	-01.31
9 9 1976	3163.57	16.43	00.11
9 16 1976	3163.61	16.39	-00.04
10 20 1976	3165.44	14.56	-01.83
11 17 1976	3164.41	15.59	01.03
12 21 1976	3164.60	15.40	-00.19
1 21 1977	3164.60	15.40	00.00
3 2 1977	3164.63	15.37	-00.03
4 5 1977	3164.90	15.10	-00.27
5 3 1977	3164.42	15.58	00.48
5 26 1977	3164.21	15.79	00.21
6 21 1977	3163.92	16.08	00.29
7 26 1977	3163.33	16.67	00.59
8 23 1977	3163.01	16.99	00.32
1 3 1978	3164.42	15.58	-01.41
1 20 1978	3164.54	15.46	-00.12
3 7 1978	3164.61	15.39	-00.07
4 6 1978	3164.55	15.45	00.06
6 14 1978	3164.48	15.52	00.07
7 8 1978	3164.03	15.97	00.45
8 30 1978	3163.21	16.79	00.82
10 16 1978	3164.00	16.00	-00.79
12 6 1978	3164.41	15.59	-00.41
1 10 1979	3164.50	15.50	-00.09
2 8 1979	3164.54	15.46	-00.04
3 9 1979	3165.07	14.93	-00.53
3 30 1979	3164.81	15.19	00.26
4 19 1979	3164.63	15.37	00.18
6 12 1979	3163.35	16.65	01.28
7 12 1979	3163.70	16.30	-00.35
8 7 1979	3163.67	16.33	00.03
10 19 1979	3164.26	15.74	-00.59

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP8B

WATER LEVEL (FEET ABOVE MSL)



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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 8B (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		091676	122176	040577	040577	062177
POTASSIUM	PPM	19.00	9.00	10.00	10.00	10.00
SODIUM	PPM	322	285	300	300	300
CALCIUM	PPM	130	130	123	123	63.00
MAGNESIUM	PPM	85.00	92.00	87.00	87.00	85.00
SULFATE	PPM	787	774	752	752	709
CHLORIDE	PPM	20.00	12.00	13.00	13.00	14.00
CARBONATE	PPM	24.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	598	622	634	634	512
FLOURIDE	PPM	1.20	0.70	1.30	1.30	1.20
SILICON DIO	PPM	32.00	26.00	28.00	28.00	30.00
TOTAL P	PPM	0.07	0.01	0.04	0.04	0.10
NITRATE	PPM	1.00	1.00	0.10	0.10	0.10
POTASSIUM	EPM	0.49	0.23	0.26	0.26	0.26
SODIUM	EPM	14.01	12.40	13.05	13.05	13.05
CALCIUM	EPM	6.49	6.49	6.14	6.14	3.14
MAGNESIUM	EPM	6.99	7.57	7.16	7.16	6.99
SULFATE	EPM	16.39	16.11	15.66	15.66	14.76
CHLORIDE	EPM	0.56	0.34	0.37	0.37	0.39
CARBONATE	EPM	0.80	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.80	10.19	10.39	10.39	8.39
FLOURIDE	EPM	0.06	0.04	0.07	0.07	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		27.97	26.68	26.60	26.60	23.44
TOTAL ANIONS		27.47	26.60	26.39	26.39	23.51
DEVIATION		98.20	99.67	99.20	99.20	100
TDS (calc.)		1681	1608	1597	1597	1433
TDS @180		1672	1663	1615	1615	1542
TOTAL HARDNESS		674	704	662	662	507
ALKALINITY		530	510	520	520	420
NON-CARB HARD		144	194	142	142	87.00
LAB CONDUCTIVITY		1800	2300	2250	2250	2192
FIELD COND.						
LAB pH		8.70	7.90	8.10	8.10	8.10
FIELD pH		6.60	7.00	7.70	7.70	

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

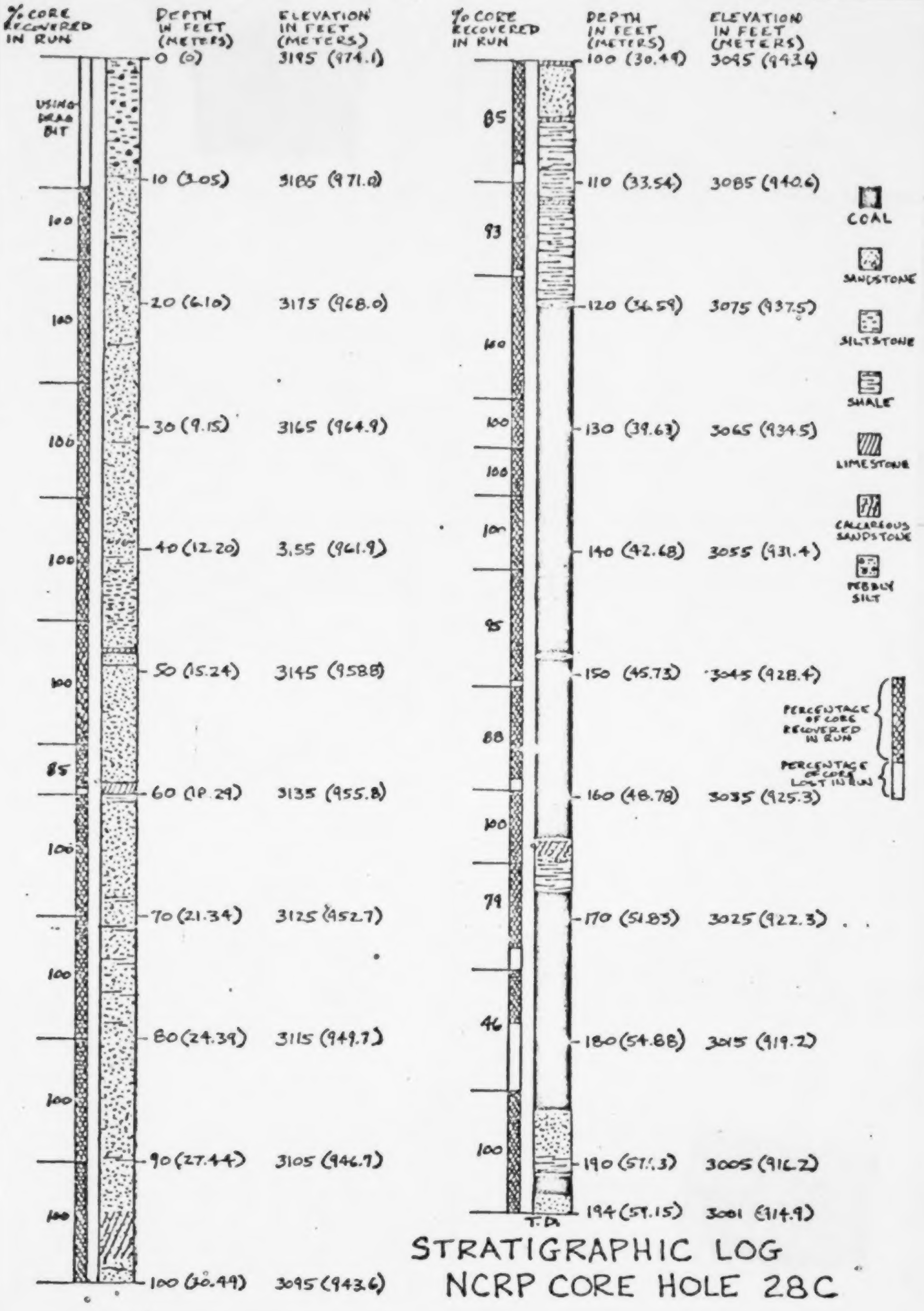
EPA-287 (Cin.)
(4-76)

WELL NCRP 8B (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		110777	MEAN	ST.DEV	#
POTASSIUM	PPM	9.00	11.17	3.53	6.00
SODIUM	PPM	340	308	17.99	6.00
CALCIUM	PPM	78.00	108	26.90	6.00
MAGNESIUM	PPM	84.00	86.67	2.62	6.00
SULFATE	PPM	679	742	37.21	6.00
CHLORIDE	PPM	13.00	14.17	2.67	6.00
CARBONATE	PPM	0.00	4.00	8.94	6.00
BICARBONATE	PPM	671	612	49.57	6.00
FLOURIDE	PPM	1.30	1.17	0.21	6.00
SILICON DIO	PPM	21.00	27.50	3.45	6.00
TOTAL P	PPM	0.01	0.04	0.04	6.00
NITRATE	PPM	0.10	0.33	0.48	6.00
POTASSIUM	EPM	0.23	0.29		
SODIUM	EPM	14.79	13.39		
CALCIUM	EPM	3.89	5.38		
MAGNESIUM	EPM	6.91	7.13		
SULFATE	EPM	14.14	15.45		
CHLORIDE	EPM	0.37	0.40		
CARBONATE	EPM	0.00	0.13		
BICARBONATE	EPM	11.00	10.03		
FLOURIDE	EPM	0.07	0.06		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		25.82	26.19	1.38	6.00
TOTAL ANIONS		25.47	25.97	1.24	6.00
DEVIATION		98.65	99.20	0.67	6.00
TDS (calc.)		1533	1575	76.62	6.00
TDS @180		1520	1604	56.64	6.00
TOTAL HARDNESS		539	625	73.82	6.00
ALKALINITY		550	508	41.40	6.00
NON-CARB HARD		0.00	118	61.22	6.00
LAB CONDUCTIVITY		2107	2150	168	6.00
FIELD COND.		1420	1420	0.00	1.00
LAB pH		8.20	8.18	0.25	6.00
FIELD pH		7.20	7.24	0.42	5.00

BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
BEGIN LAST LINE OF TEXT
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)


% CORE RECOVERED IN RUN
DEPTH IN FEET (METERS)
ELEVATION IN FEET (METERS)
0 (0)
3195 (974.1)
USING DRAG BIT
10 (3.05)
3185 (971.0)
100
20 (6.10)
3175 (968.0)
100
30 (9.15)
3165 (964.9)
100
40 (12.20)
3,55 (961.9)
100
50 (15.24)
3145 (958.8)
100
85
60 (18.29)
3135 (955.8)
100
70 (21.34)
3125 (952.7)
100
80 (24.39)
3115 (949.7)
100
90 (27.44)
3105 (946.7)
100
100 (30.49)
3095 (943.6)
% CORE RECOVERED IN RUN
DEPTH IN FEET (METERS)
ELEVATION IN FEET (METERS)
100 (30.49)
3095 (943.4)
85
110 (33.54)
3085 (940.6)
93
120 (36.59)
3075 (937.5)
100
100
130 (39.63)
3065 (934.5)
100
100
140 (42.68)
3055 (931.4)
95
150 (45.73)
3045 (928.4)
88
160 (48.78)
3035 (925.3)
100
79
170 (51.83)
3025 (922.3)
46
180 (54.88)
3015 (919.2)
100
190 (57.93)
3005 (916.2)
194 (59.15)
3001 (914.9)
T.D.
COAL
SANDSTONE
SILTSTONE
SHALE
LIMESTONE
CALCAREOUS SANDSTONE
PEBBLY SILT
PERCENTAGE OF CORE RECOVERED IN RUN
PERCENTAGE OF CORE LOST IN RUN
STRATIGRAPHIC LOG
NCRP CORE HOLE 28C

Stratigraphic log for NCRP 28C

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

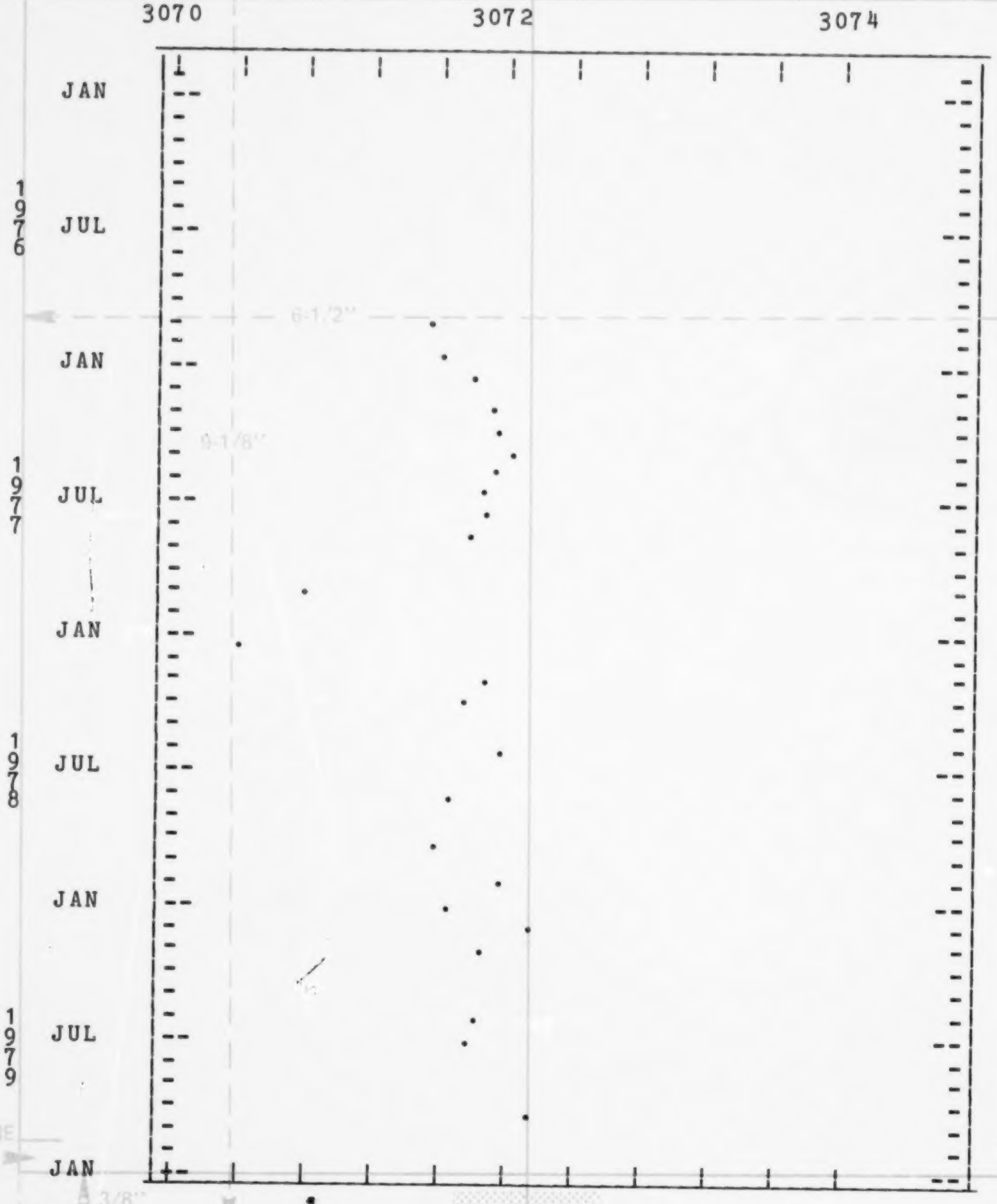
WATER LEVEL FOR WELL NCRP28C   2 / 14 / 1980

ELEVATION OF WELL NCRP28C IS 3200

DATE	LEVEL	READING	CHANGE
11 7 1976	3071.60	128.40	00.00
12 21 1976	3071.66	128.34	-00.06
1 21 1977	3071.84	128.16	-00.18
3 2 1977	3071.95	128.05	-00.11
4 5 1977	3071.98	128.02	-00.03
5 3 1977	3072.06	127.94	-00.08
5 26 1977	3071.97	128.03	00.09
6 21 1977	3071.90	128.10	00.07
7 26 1977	3071.92	128.08	-00.02
8 23 1977	3071.83	128.17	00.09
11 7 1977	3070.91	129.09	00.92
1 20 1978	3070.55	129.45	00.36
3 7 1978	3071.92	128.08	-01.37
4 6 1978	3071.80	128.20	00.12
6 14 1978	3072.00	128.00	-00.20
8 15 1978	3071.72	128.28	00.28
10 19 1978	3071.64	128.36	00.08
12 5 1978	3072.00	128.00	-00.36
1 10 1979	3071.71	128.29	00.29
2 8 1979	3072.17	127.83	-00.46
3 9 1979	3071.90	128.10	00.27
6 12 1979	3071.87	128.13	00.03
7 12 1979	3071.83	128.17	00.04
10 19 1979	3072.17	127.83	-00.34
2 10 1980	3072.17	127.83	00.00

HYDROGRAPH FOR WELL NCRP28C

WATER LEVEL (FEET ABOVE M.S.L.)



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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well: NCRP #29 AB
Date Completed: 7/14/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-9.5'	9.5'	Silt, Sandy, Yellowish-Brown
9.5'-17'	7.5'	Silt, Gravelly, with many flat, rounded red shale cobble and sandstone cobbles, and black clinker fragments
17'-22'	5'	Clay, Sandy, Yellowish to Gray
22'-26'	4'	Silt, Clayey, w/some pebbles
26'-28'	2'	Clay
28'-29'	1'	Sand, Yellowish-Brown, Clayey
29'-30'	1'	Hard Layer
30'-33'	3'	Sand, Yellowish-Brown, Clayey
33'-47'	14'	Clayey Gravel, Brown (1/8"-1/4" Gravel Size)
47'-57'	10'	Clay, Brown, Some Gravel Injected water in Hole at 45' to bring up material, Quite a bit of gravel at 55'
57'-60'	3'	Clay, Gray at 60' A flow of gal./min. H_2O resulted after we sat for an hour
60'-71'	11'	Shale, Gray, w/a few coal streaks, Silty Below 65'

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

#29 AB continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
71'-74'	3'	Sandstone, Fine, Gray, Firm
74'-86'	12'	Shale, Gray, Silty
86'-119'	33'	Shale, Gray - Gravel caving in off walls up above samples probably in-accurate
119'-121'	2'	Cuttings Turn Brownish
121'-124'	3'	Sandstone, Gray, Soft
124'-126'	2'	Sandstone, Hard
126'-128'	2	Sandstone, Soft
128'-129'	1	Sandstone, Hard
129'-130'	1	Sandstone, Soft, Fine
130'-137'	7'	Sandstone, Hard, H_2O from sandstone, 3 gal./min. Total flow 6 gal./min.
137'-158'	21'	Shale, Gray, Sandy
158'-168'	10'	Shale, Gray, Partly Sandy
168'-173'	5'	Shale, Gray, Firm
173'-177'	4'	Shale, Gray, Less Firm
177'-178'	1'	Shale, Brown
178'-252'	74'	Coal-(Samples have some gravel cuttings, caved in from above Shale Parting at 235' 2' Thick? Total Flow H_2O 10 gal./min.
252'-257'	5'	Shale, Gray

6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

#29 AB continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
257'-258'	3'	Hard Streak
258'-260'	2'	Shale, Gray

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP29A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3275

DATE	LEVEL	READING	CHANGE
7 27 1976	3095.05	179.95	00.00
9 8 1976	3103.46	171.54	-08.41
9 16 1976	3093.45	181.55	10.01
10 20 1976	3231.67	43.33	-138.22
11 17 1976	3231.33	43.67	00.34
12 21 1976	3230.95	44.05	00.38
1 21 1977	3230.57	44.43	00.38
3 2 1977	3197.01	77.99	33.56
4 5 1977	3229.50	45.50	-32.49
5 3 1977	3229.57	45.43	-00.07
5 26 1977	3229.51	45.49	00.06
6 21 1977	3229.60	45.40	-00.09
7 26 1977	3229.85	45.15	-00.25
8 23 1977	3229.98	45.02	-00.13
11 1 1977	3230.91	44.09	-00.93
12 21 1977	3231.51	43.49	-00.60
1 20 1978	3232.06	42.94	-00.55
3 7 1978	3229.28	45.72	02.78
4 6 1978	3228.97	46.03	00.31
6 14 1978	3228.66	46.34	00.31
8 15 1978	3230.14	44.86	-01.48
10 19 1978	3233.68	41.32	-03.54
12 6 1978	3235.90	39.10	-02.22
1 10 1979	3235.05	39.95	00.85
2 8 1979	3236.71	38.29	-01.66
3 9 1979	3238.67	36.33	-01.96
3 30 1979	3240.31	34.69	-01.64
4 16 1979	3240.71	34.29	-00.40
4 19 1979	3240.58	34.42	00.13
6 15 1979	3240.71	34.29	-00.13
7 12 1979	3240.89	34.11	-00.18
8 7 1979	3241.46	33.54	-00.57
9 7 1979	3242.11	32.89	-00.65
10 5 1979	3242.45	32.55	-00.34
10 19 1979	3242.75	32.25	-00.30

6-1/2''
6-1/8''
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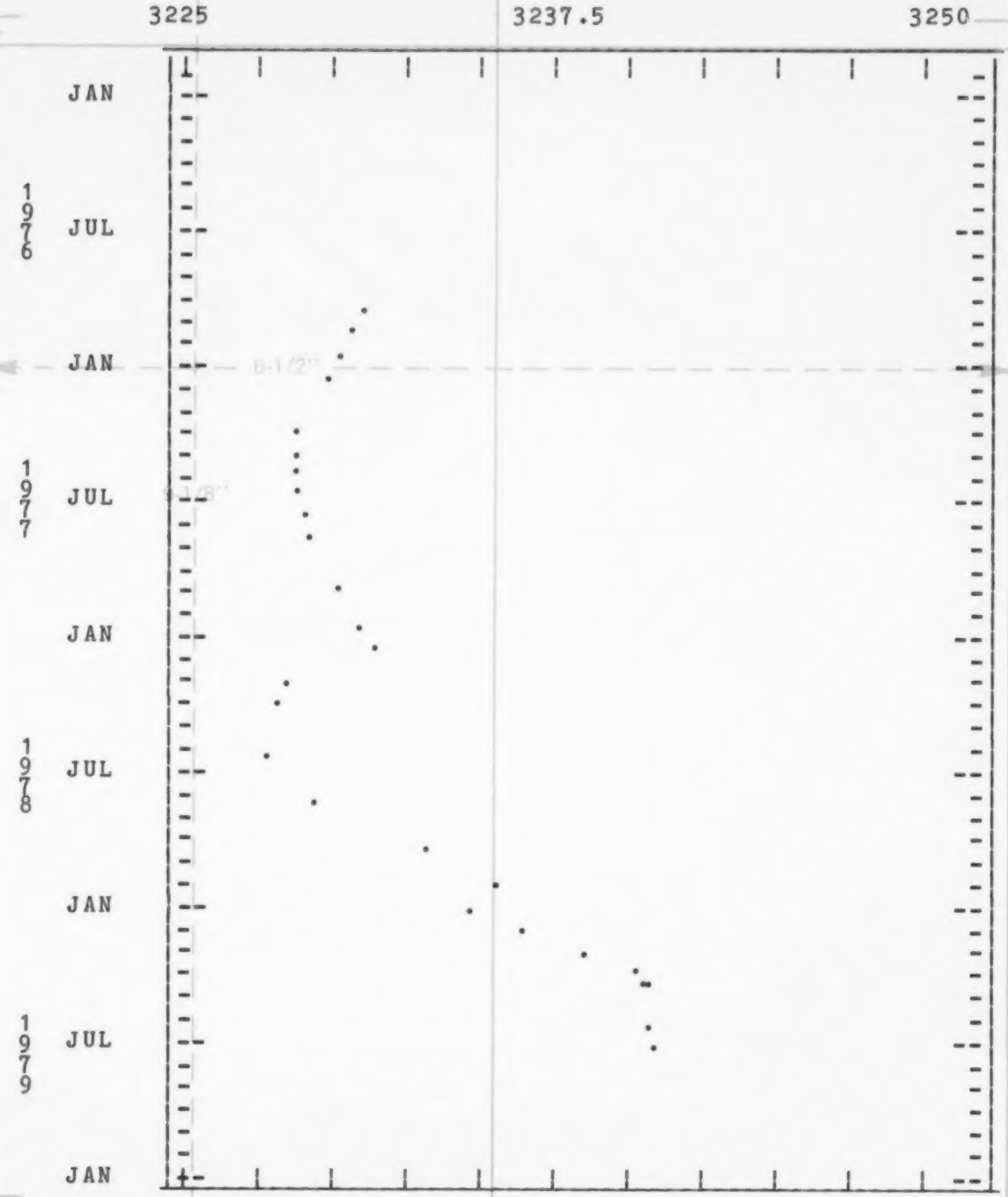
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP29A

WATER LEVEL (FEET ABOVE MSL)



8-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 29A 1 of 2

DATE		091676	122176	040577	062177	110177
POTASSIUM	PPM	15.00	4.00	4.00	3.00	5.00
SODIUM	PPM	560	420	450	440	440
CALCIUM	PPM	20.00	0.00	2.00	6.00	4.00
MAGNESIUM	PPM	140	3.00	2.00	2.00	5.00
SULFATE	PPM	1300	270	300	292	298
CHLORIDE	PPM	14.00	8.00	8.00	9.00	9.00
CARBONATE	PPM	36.00	60.00	48.00	48.00	24.00
BICARBONATE	PPM	610	671	683	671	744
FLOURIDE	PPM	1.20	6.20	6.40	6.70	6.20
SILICON DIO	PPM	12.00	7.00	7.00	6.00	6.00
TOTAL P	PPM	0.02	0.01	0.15	0.03	0.15
NITRATE	PPM	1.00	1.00	0.50	0.20	0.10
POTASSIUM	EPM	0.38	0.10	0.10	0.08	0.13
SODIUM	EPM	24.36	18.27	19.57	19.14	19.14
CALCIUM	EPM	1.00	0.00	0.10	0.30	0.20
MAGNESIUM	EPM	11.52	0.25	0.16	0.16	0.41
SULFATE	EPM	27.07	5.62	6.25	6.08	6.20
CHLORIDE	EPM	0.39	0.23	0.23	0.25	0.25
CARBONATE	EPM	1.20	2.00	1.60	1.60	0.80
BICARBONATE	EPM	10.00	11.00	11.19	11.00	12.19
FLOURIDE	EPM	0.06	0.33	0.34	0.35	0.33
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		37.26	18.62	19.94	19.68	19.88
TOTAL ANIONS		38.62	19.11	19.55	19.22	19.71
DEVIATION		104	103	98.02	97.65	99.17
TDS (calc.)		2385	1095	1150	1130	1152
TDS @180		2382	1112	1073	1299	1155
TOTAL HARDNESS		627	12.00	14.00	24.00	29.00
ALKALINITY		560	650	640	630	650
NON-CARB HARD		67.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		3000	1900	1920	1795	1764
FIELD COND.						1310
LAB pH		8.80	8.60	8.60	8.50	8.60
FIELD pH		6.40	6.80	8.50		

EPA-287 (Cin.)
(4-76)

WELL NCRP 29A 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	6.20	4.45	5.00
SODIUM	PPM	462	49.96	5.00
CALCIUM	PPM	6.40	7.09	5.00
MAGNESIUM	PPM	30.40	54.81	5.00
SULFATE	PPM	492	404	5.00
CHLORIDE	PPM	9.60	2.24	5.00
CARBONATE	PPM	43.20	12.24	5.00
BICARBONATE	PPM	676	42.61	5.00
FLOURIDE	PPM	5.34	2.08	5.00
SILICON DIO	PPM	7.60	2.24	5.00
TOTAL P	PPM	0.07	0.07	5.00
NITRATE	PPM	0.28	0.62	5.00
POTASSIUM	EPM	0.16		
SODIUM	EPM	20.10		
CALCIUM	EPM	0.32		
MAGNESIUM	EPM	2.50		
SULFATE	EPM	10.24		
CHLORIDE	EPM	0.27		
CARBONATE	EPM	1.44		
BICARBONATE	EPM	11.08		
FLOURIDE	EPM	0.28		
NITRATE	EPM	0.00		
TOTAL CATIONS		23.08	7.11	5.00
TOTAL ANIONS		23.24	7.69	5.00
DEVIATION		100	2.46	5.00
TDS (calc.)		1382	502	5.00
TDS @180		1404	495	5.00
TOTAL HARDNESS		141	243	5.00
ALKALINITY		626	33.82	5.00
NON-CARB HARD		13.40	26.80	5.00
LAB CONDUCTIVITY		2076	466	5.00
FIELD COND.		1310	0.00	1.00
LAB pH		8.62	0.10	5.00
FIELD pH		7.23	0.91	3.00

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP29B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3275

DATE	LEVEL	READING	CHANGE
7 27 1976	3228.90	46.10	00.00
9 9 1976	3228.66	46.34	00.24
9 16 1976	3226.16	48.84	02.50
10 20 1976	3227.47	47.53	-01.31
11 17 1976	3225.70	49.30	01.77
12 21 1976	3226.11	48.89	-00.41
1 31 1977	3225.53	49.47	00.58
3 2 1977	3224.67	50.33	00.86
4 5 1977	3223.80	51.20	00.87
5 3 1977	3223.81	51.19	-00.01
5 26 1977	3223.87	51.13	-00.06
6 21 1977	3224.15	50.85	-00.28
7 26 1977	3224.47	50.53	-00.32
8 23 1977	3224.79	50.21	-00.32
11 1 1977	3225.18	49.82	-00.39
12 21 1977	3226.10	48.90	-00.92
1 20 1978	3225.98	49.02	00.12
3 7 1978	3222.26	52.74	03.72
4 6 1978	3222.71	52.29	-00.45
6 6 1978	3222.00	53.00	00.71
8 15 1978	3224.00	51.00	-02.00
10 19 1978	3229.12	45.88	-05.12
12 6 1978	3232.70	42.30	-03.58
1 10 1979	3233.65	41.35	-00.95
2 8 1979	3236.00	39.00	-02.35
3 9 1979	3237.09	37.91	-01.09
3 30 1979	3238.66	36.34	-01.57
4 16 1979	3239.56	35.44	-00.90
4 19 1979	3238.96	36.04	00.60
6 12 1979	3239.01	35.99	-00.05
7 12 1979	3239.30	35.70	-00.29
8 7 1979	3239.89	35.11	-00.59
10 19 1979	3241.20	33.80	-01.31

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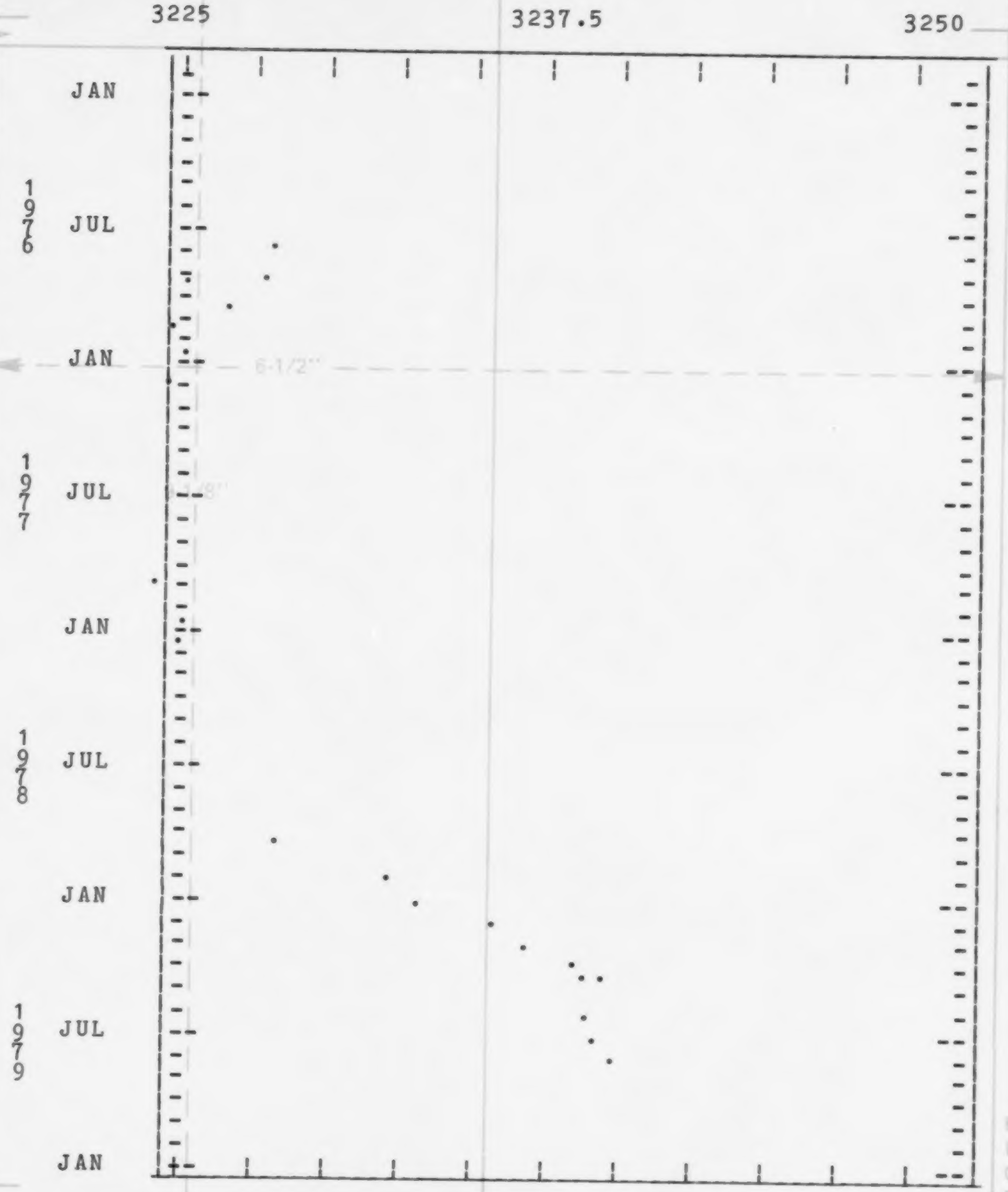
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP29B

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
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BOTTOM OF IMAGE AREA. OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 29B (UNCONSOLIDATED AQUIFER) 1 of 2

DATE		091676	122176	040577	062177
POTASSIUM	PPM	11.00	29.00	12.00	11.00
SODIUM	PPM	110	115	130	116
CALCIUM	PPM	42.00	40.00	55.00	63.00
MAGNESIUM	PPM	4.00	54.00	30.00	43.00
SULFATE	PPM	280	248	280	249
CHLORIDE	PPM	11.00	5.00	17.00	17.00
CARBONATE	PPM	0.00	0.00	0.00	0.00
BICARBONATE	PPM	63.00	390	305	390
FLOURIDE	PPM	0.90	1.00	0.81	0.58
SILICON DIO	PPM	46.00	30.00	35.00	25.00
TOTAL P	PPM	0.33	0.01	0.04	0.27
NITRATE	PPM	3.00	1.00	1.20	1.40
POTASSIUM	EPM	0.28	0.74	0.31	0.28
SODIUM	EPM	4.78	5.00	5.65	5.05
CALCIUM	EPM	2.10	2.00	2.74	3.14
MAGNESIUM	EPM	0.33	4.44	2.47	3.54
SULFATE	EPM	5.83	5.16	5.83	5.18
CHLORIDE	EPM	0.31	0.14	0.48	0.48
CARBONATE	EPM	0.00	0.00	0.00	0.00
BICARBONATE	EPM	1.03	6.39	5.00	6.39
FLOURIDE	EPM	0.05	0.05	0.04	0.03
NITRATE	EPM	0.01	0.00	0.00	0.00
TOTAL CATIONS		7.49	12.18	11.17	12.01
TOTAL ANIONS		7.14	11.71	11.23	11.96
DEVIATION		95.36	96.14	100	99.64
TDS (calc.)		489	683	674	691
TDS @180		508	662	664	770
TOTAL HARDNESS		120	322	261	332
ALKALINITY		52.00	320	250	320
NON-CARB HARD		68.00	2.00	11.00	12.00
LAB CONDUCTIVITY		550	1140	1140	1319
FIELD COND.		91676			
LAB pH		7.90	8.20	7.90	7.70
FIELD pH		7.60	6.80	7.90	

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 29B (UNCONSOLIDATED AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	15.75	7.66	4.00
SODIUM	PPM	118	7.43	4.00
CALCIUM	PPM	50.00	9.46	4.00
MAGNESIUM	PPM	32.75	18.65	4.00
SULFATE	PPM	264	15.75	4.00
CHLORIDE	PPM	12.50	4.97	4.00
CARBONATE	PPM	0.00	0.00	4.00
BICARBONATE	PPM	287	134	4.00
FLOURIDE	PPM	0.82	0.16	4.00
SILICON DIO	PPM	34.00	7.78	4.00
TOTAL P	PPM	0.16	0.15	4.00
NITRATE	PPM	1.15	1.42	4.00
POTASSIUM	EPM	0.40		
SODIUM	EPM	5.12		
CALCIUM	EPM	2.49		
MAGNESIUM	EPM	2.69		
SULFATE	EPM	5.50		
CHLORIDE	EPM	0.35		
CARBONATE	EPM	0.00		
BICARBONATE	EPM	4.70		
FLOURIDE	EPM	0.04		
NITRATE	EPM	0.00		
TOTAL CATIONS		10.71	1.90	4.00
TOTAL ANIONS		10.51	1.96	4.00
DEVIATION		97.90	2.19	4.00
TDS (calc.)		634	84.08	4.00
TDS @180		651	93.41	4.00
TOTAL HARDNESS		259	84.59	4.00
ALKALINITY		235	110	4.00
NON-CARB HARD		23.25	26.13	4.00
LAB CONDUCTIVITY		1037	291	4.00
FIELD COND.		91676	0.00	1.00
LAB pH		7.92	0.18	4.00
FIELD pH		7.43	0.46	3.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well: NCRP #9 B
Date Completed: 3/25/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-9'	9'	Sand, Brown
9'-13'	4'	Gravel
13'-15'	2'	Sandstone, Brown, Fine
15'-18'	3'	Sandstone, Brown, Fine
18'-25'	7'	Sandy Shale, Brown, Fine
25'-26'	1'	Shale, Brown
26'-40'	14'	Shale, Sandstone, Gray, Fine
40'-44'	4'	Shale, Black
44'-44.5	.5'	Shale, Black, Coal
44.5'-46'	1.5'	Shale, Gray
46'-48'	2'	Sandstone, Gray, Fine
48'-53'	5'	Coal
53'-54'	1'	Shale, Black, Gray

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP9A

GROUNDWATER LEVELS (FEET--DATUM MSL)

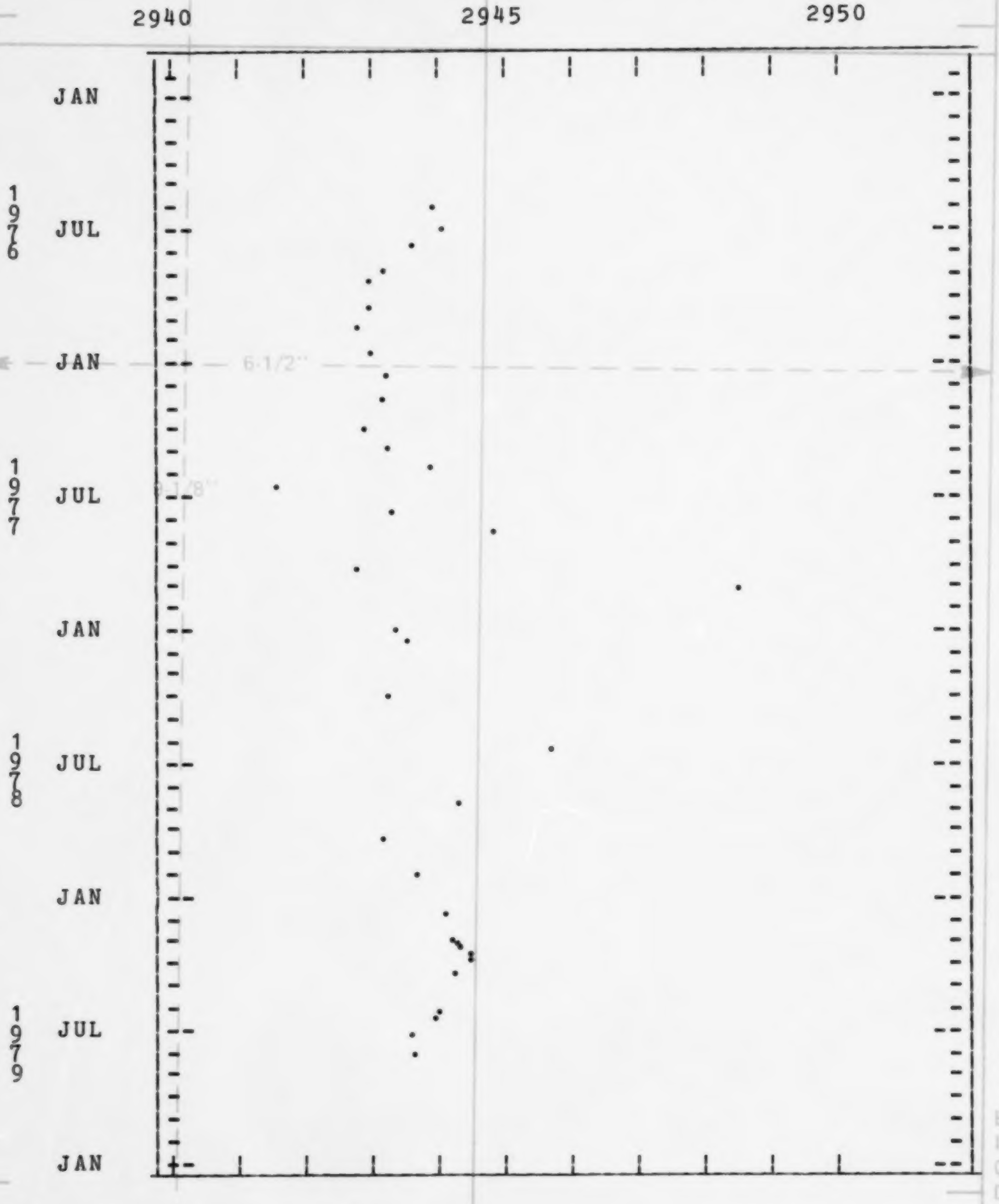
elevation at top of well casing is 2960

DATE	LEVEL	READING	CHANGE
6 2 1976	2944.10	15.90	00.00
7 6 1976	2944.23	15.77	-00.13
7 27 1976	2943.81	16.19	00.42
9 2 1976	2943.41	16.59	00.40
9 16 1976	2943.21	16.79	00.20
10 20 1976	2943.21	16.79	00.00
11 18 1976	2943.05	16.95	00.16
12 20 1976	2943.23	16.77	-00.18
1 21 1977	2943.45	16.55	-00.22
2 22 1977	2943.39	16.61	00.06
4 4 1977	2943.14	16.86	00.25
5 2 1977	2943.46	16.54	-00.32
5 26 1977	2944.06	15.94	-00.60
6 21 1977	2941.91	18.09	02.15
7 27 1977	2943.51	16.49	-01.60
8 24 1977	2944.94	15.06	-01.43
10 11 1977	2943.02	16.98	01.92
11 8 1977	2948.35	11.65	-05.33
1 5 1978	2943.57	16.43	04.78
1 20 1978	2943.72	16.28	-00.15
4 6 1978	2943.46	16.54	00.26
6 14 1978	2945.73	14.27	-02.27
8 30 1978	2944.44	15.56	01.29
10 16 1978	2943.40	16.60	01.04
12 6 1978	2943.86	16.14	-00.46
1 30 1979	2944.26	15.74	-00.40
3 6 1979	2944.35	15.65	-00.09
3 9 1979	2944.43	15.57	-00.08
3 15 1979	2944.46	15.54	-00.03
3 22 1979	2944.59	15.41	-00.13
3 30 1979	2944.60	15.40	-00.01
4 19 1979	2944.39	15.61	00.21
6 12 1979	2944.16	15.84	00.23
6 18 1979	2944.12	15.88	00.04
7 12 1979	2943.79	16.21	00.33
8 7 1979	2943.82	16.18	-00.03
10 19 1979	2943.52	16.48	00.30

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP9A



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 9A (ROBINSON COAL AQUIFER) 1 of 2

DATE		102076	122176	040577	062177	110877
POTASSIUM	PPM	10.00	8.00	4.00	4.00	3.00
SODIUM	PPM	213	215	415	410	410
CALCIUM	PPM	74.00	36.00	4.00	4.00	4.00
MAGNESIUM	PPM	24.00	25.00	4.00	2.00	2.00
SULFATE	PPM	162	133	11.00	7.00	4.00
CHLORIDE	PPM	16.00	12.00	19.00	30.00	21.00
CARBONATE	PPM	0.00	72.00	36.00	24.00	24.00
BICARBONATE	PPM	671	512	976	976	1037
FLOURIDE	PPM	1.80	1.40	4.20	4.30	4.10
SILICON DIO	PPM	12.00	12.00	7.00	7.00	9.00
TOTAL P	PPM	0.02	0.01	0.08	0.09	0.03
NITRATE	PPM	2.00	1.00	0.10	10.10	0.30
POTASSIUM	EPM	0.26	0.20	0.10	0.10	0.08
SODIUM	EPM	9.27	9.35	18.05	17.84	17.84
CALCIUM	EPM	3.69	1.80	0.20	0.20	0.20
MAGNESIUM	EPM	1.97	2.06	0.33	0.16	0.16
SULFATE	EPM	3.37	2.77	0.23	0.15	0.08
CHLORIDE	EPM	0.45	0.34	0.54	0.85	0.59
CARBONATE	EPM	0.00	2.40	1.20	0.80	0.80
BICARBONATE	EPM	11.00	8.39	16.00	16.00	17.00
FLOURIDE	EPM	0.09	0.07	0.22	0.23	0.22
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		15.19	13.41	18.68	18.30	18.28
TOTAL ANIONS		14.80	13.88	18.04	17.79	18.53
DEVIATION		97.44	104	96.57	97.23	101
TDS (calc.)		829	753	974	962	979
TDS @180		836	838	951	977	974
TOTAL HARDNESS		283	193	24.00	20.00	19.00
ALKALINITY		550	540	860	840	890
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1200	1300	1640	1649	1568
FIELD COND.						1000
LAB pH		7.90	8.20	8.40	8.30	8.70
FIELD pH		7.10	6.00	8.10		7.40

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 9A (ROBINSON COAL AQUIFER) 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	5.80	2.71	5.00
SODIUM	PPM	333	96.86	5.00
CALCIUM	PPM	24.40	27.72	5.00
MAGNESIUM	PPM	11.40	10.73	5.00
SULFATE	PPM	63.40	69.31	5.00
CHLORIDE	PPM	19.60	6.02	5.00
CARBONATE	PPM	31.20	23.52	5.00
BICARBONATE	PPM	834	206	5.00
FLOURIDE	PPM	3.16	1.28	5.00
SILICON DIO	PPM	9.40	2.24	5.00
TOTAL P	PPM	0.04	0.04	5.00
NITRATE	PPM	2.30	4.02	5.00
POTASSIUM	EPM	0.15		
SODIUM	EPM	14.47		
CALCIUM	EPM	1.22		
MAGNESIUM	EPM	0.94		
SULFATE	EPM	1.32		
CHLORIDE	EPM	0.55		
CARBONATE	EPM	1.04		
BICARBONATE	EPM	13.68		
FLOURIDE	EPM	0.17		
NITRATE	EPM	0.00		
TOTAL CATIONS		16.77	2.10	5.00
TOTAL ANIONS		16.61	1.89	5.00
DEVIATION		99.24	2.74	5.00
TDS (calc.)		899	91.88	5.00
TDS @180		915	64.48	5.00
TOTAL HARDNESS		108	110	5.00
ALKALINITY		736	157	5.00
NON-CARB HARD		0.00	0.00	5.00
LAB CONDUCTIVITY		1471	186	5.00
FIELD COND.		1000	0.00	1.00
LAB pH		8.30	0.26	5.00
FIELD pH		7.15	0.76	4.00

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
6-1/2"
9-1/8"
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

1 of 1

WELL NCRP9B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2960

DATE	LEVEL	READING	CHANGE
6 2 1976	2937.91	22.09	00.00
7 6 1976	2938.95	21.05	-01.04
7 27 1976	2937.59	22.41	01.36
9 2 1976	2940.67	19.33	-03.08
9 16 1976	2938.04	21.96	02.63
10 20 1976	2937.24	22.76	00.80
11 18 1976	2937.35	22.65	-00.11
12 21 1976	2937.52	22.48	-00.17
1 21 1977	2937.69	22.31	-00.17
2 22 1977	2937.87	22.13	-00.18
4 4 1977	2937.46	22.54	00.41
5 2 1977	2937.98	22.02	-00.52
5 26 1977	2938.46	21.54	-00.48
6 21 1977	2938.23	21.77	00.23
7 27 1977	2937.28	22.72	00.95
8 24 1977	2937.08	22.92	00.20
10 11 1977	2936.90	23.10	00.18
11 10 1977	2937.49	22.51	-00.59
1 5 1978	2937.30	22.70	00.19
1 20 1978	2937.36	22.64	-00.06
4 6 1978	2937.68	22.32	-00.32
6 14 1978	2940.36	19.64	-02.68
8 30 1978	2937.96	22.04	02.40
10 16 1978	2937.58	22.42	00.38
12 6 1978	2937.79	22.21	-00.21
1 30 1979	2938.03	21.97	-00.24
3 6 1979	2937.71	22.29	00.32
3 9 1979	2938.18	21.82	-00.47
3 15 1979	2938.69	21.31	-00.51
3 22 1979	2938.42	21.58	00.27
3 30 1979	2938.02	21.98	00.40
4 19 1979	2937.74	22.26	00.28
6 12 1979	2937.98	22.02	-00.24
6 18 1979	2937.74	22.26	00.24
7 12 1979	2936.91	23.09	00.83
8 7 1979	2936.28	23.72	00.63
10 19 1979	2937.00	23.00	-00.72

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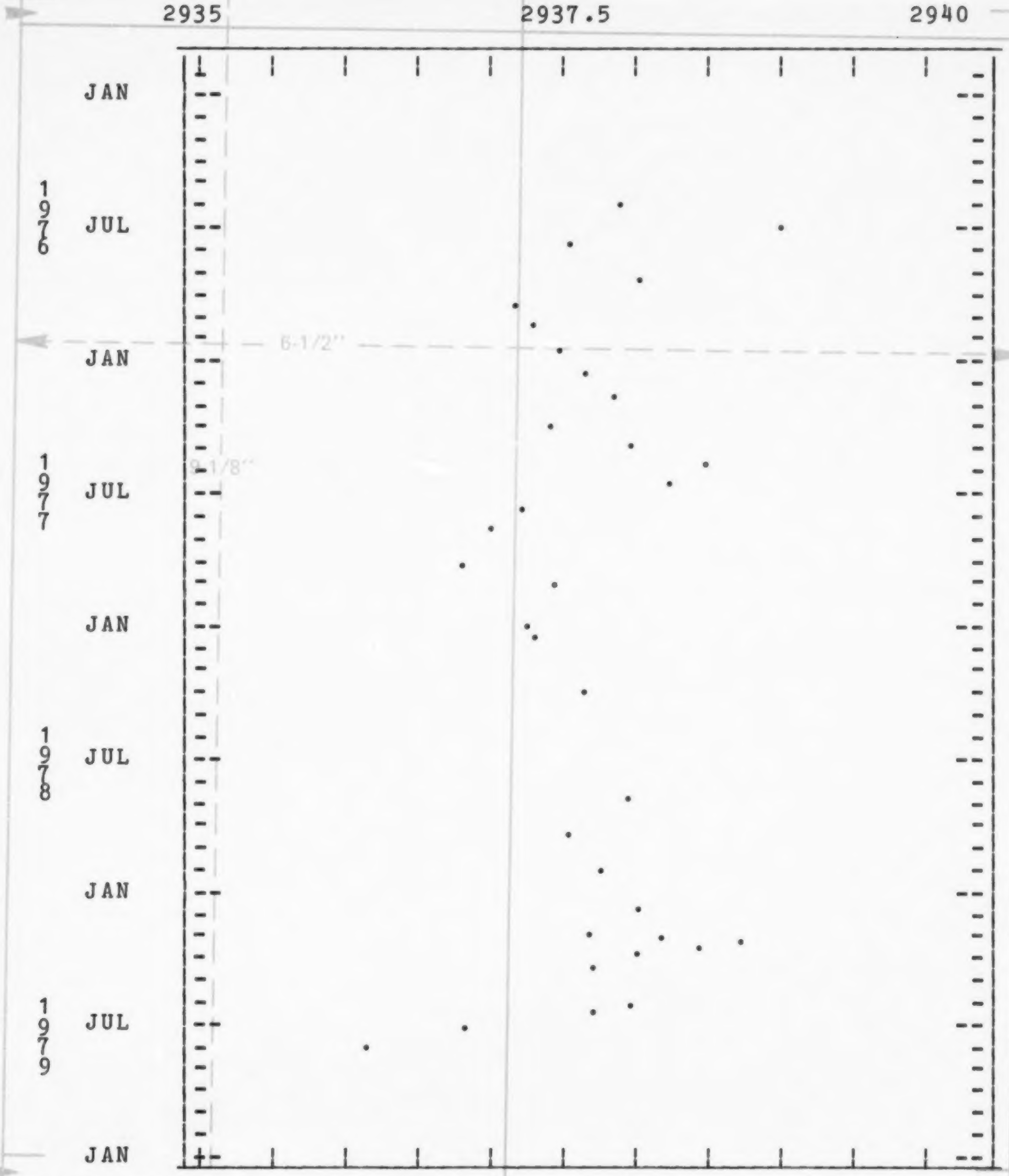
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
6-1/2
8-1/8"
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP9B

WATER LEVEL (FEET ABOVE MSL)



6-1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

EPA-287 (Cin.)
(4-76)

WELL NCRP 9B 1 of 2

DATE		102076	122176	040577	062177	111077
POTASSIUM	PPM	11.00	11.00	12.00	11.00	10.00
SODIUM	PPM	119	120	125	116	140
CALCIUM	PPM	16.00	14.00	8.00	14.00	25.00
MAGNESIUM	PPM	13.00	16.00	18.00	27.00	35.00
SULFATE	PPM	210	219	217	211	213
CHLORIDE	PPM	12.00	7.00	7.00	6.00	8.00
CARBONATE	PPM	48.00	30.00	18.00	0.00	6.00
BICARBONATE	PPM	73.00	110	146	238	329
FLOURIDE	PPM	0.70	1.40	0.89	0.91	0.76
SILICON DIO	PPM	21.00	21.00	21.00	19.00	18.00
TOTAL P	PPM	0.02	0.01	0.02	0.18	0.01
NITRATE	PPM	1.00	1.00	0.20	0.10	0.10
POTASSIUM	EPM	0.28	0.28	0.31	0.28	0.26
SODIUM	EPM	5.18	5.22	5.44	5.05	6.09
CALCIUM	EPM	0.80	0.70	0.40	0.70	1.25
MAGNESIUM	EPM	1.07	1.32	1.48	2.22	2.88
SULFATE	EPM	4.37	4.56	4.52	4.39	4.43
CHLORIDE	EPM	0.34	0.20	0.20	0.17	0.23
CARBONATE	EPM	1.60	1.00	0.60	0.00	0.20
BICARBONATE	EPM	1.20	1.80	2.39	3.90	5.39
FLOURIDE	EPM	0.04	0.07	0.05	0.05	0.04
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		7.33	7.52	7.62	8.25	10.47
TOTAL ANIONS		7.46	7.58	7.70	8.47	10.23
DEVIATION		102	101	101	103	97.72
TDS (calc.)		465	471	477	502	599
TDS @180		494	483	493	534	598
TOTAL HARDNESS		94.00	99.00	92.00	146	207
ALKALINITY		140	140	150	195	280
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		700	800	800	854	902
FIELD COND.						640
LAB pH		8.80	9.10	8.40	8.20	8.30
FIELD pH		7.10	6.00	8.70		7.50

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
9-1/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 9B

2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	11.00	0.63	5.00
SODIUM	PPM	124	8.51	5.00
CALCIUM	PPM	15.40	5.50	5.00
MAGNESIUM	PPM	21.80	8.08	5.00
SULFATE	PPM	214	3.46	5.00
CHLORIDE	PPM	8.00	2.10	5.00
CARBONATE	PPM	20.40	17.22	5.00
BICARBONATE	PPM	179	92.81	5.00
FLOURIDE	PPM	0.93	0.25	5.00
SILICON DIO	PPM	20.00	1.26	5.00
TOTAL P	PPM	0.04	0.07	5.00
NITRATE	PPM	0.04	0.64	5.00
POTASSIUM	EPM	0.28		
SODIUM	EPM	5.39		
CALCIUM	EPM	0.77		
MAGNESIUM	EPM	1.79		
SULFATE	EPM	4.46		
CHLORIDE	EPM	0.23		
CARBONATE	EPM	0.68		
BICARBONATE	EPM	2.94		
FLOURIDE	EPM	0.05		
NITRATE	EPM	0.00		
TOTAL CATIONS		8.24	1.16	5.00
TOTAL ANIONS		8.29	1.03	5.00
DEVIATION		101	1.68	5.00
TDS (calc.)		503	49.72	5.00
TDS @180		520	42.55	5.00
TOTAL HARDNESS		128	44.40	5.00
ALKALINITY		181	53.52	5.00
NON-CARB HARD		0.00	0.00	5.00
LAB CONDUCTIVITY		811	67.37	5.00
FIELD COND.		640	0.00	1.00
LAB pH		8.56	0.34	5.00
FIELD pH		7.33	0.97	4.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL USGS1

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2955

DATE	LEVEL	READING	CHANGE
12 4 1975	2912.82	42.18	00.00
12 10 1975	2912.95	42.05	-00.13
1 16 1976	2913.52	41.48	-00.57
3 1 1976	2913.87	41.13	-00.35
3 17 1976	2913.82	41.18	00.05
4 21 1976	2913.45	41.55	00.37
6 2 1976	2914.21	40.79	-00.76
7 7 1976	2914.21	40.79	00.00
7 27 1976	2910.88	44.12	03.33
9 2 1976	2913.44	41.56	-02.56
9 16 1976	2913.22	41.78	00.22
10 20 1976	2912.93	42.07	00.29
11 18 1976	2913.15	41.85	-00.22
12 20 1976	2912.89	42.11	00.26
1 21 1977	2913.43	41.57	-00.54
3 2 1977	2913.70	41.30	-00.27
4 5 1977	2913.08	41.92	00.62
5 2 1977	2913.67	41.33	-00.59
5 26 1977	2914.52	40.48	-00.85
6 22 1977	2914.57	40.43	-00.05
7 26 1977	2913.60	41.40	00.97
8 23 1977	2913.23	41.77	00.37
10 11 1977	2912.66	42.34	00.57
1 5 1977	2915.68	39.32	-03.02
1 20 1978	2912.91	42.09	02.77
3 21 1978	2913.56	41.44	-00.65
4 6 1978	2913.43	41.57	00.13
6 15 1978	2917.65	37.35	-04.22
8 31 1978	2915.51	39.49	02.14
10 16 1978	2913.76	41.24	01.75
12 6 1978	2916.76	38.24	-03.00
2 27 1979	2912.98	42.02	03.78
3 6 1979	2914.30	40.70	-01.32
3 9 1979	2914.38	40.62	-00.08
3 12 1979	2914.45	40.55	-00.07
3 15 1979	2914.56	40.44	-00.11
3 22 1979	2914.58	40.42	-00.02
3 27 1979	2914.54	40.46	00.04
3 30 1979	2914.21	40.79	00.33
4 9 1979	2913.93	41.07	00.28

EPA-287 (Cin.)
(4-76)

WELL USGS1

GROUNDWATER LEVELS (FEET--DATUM MSL)

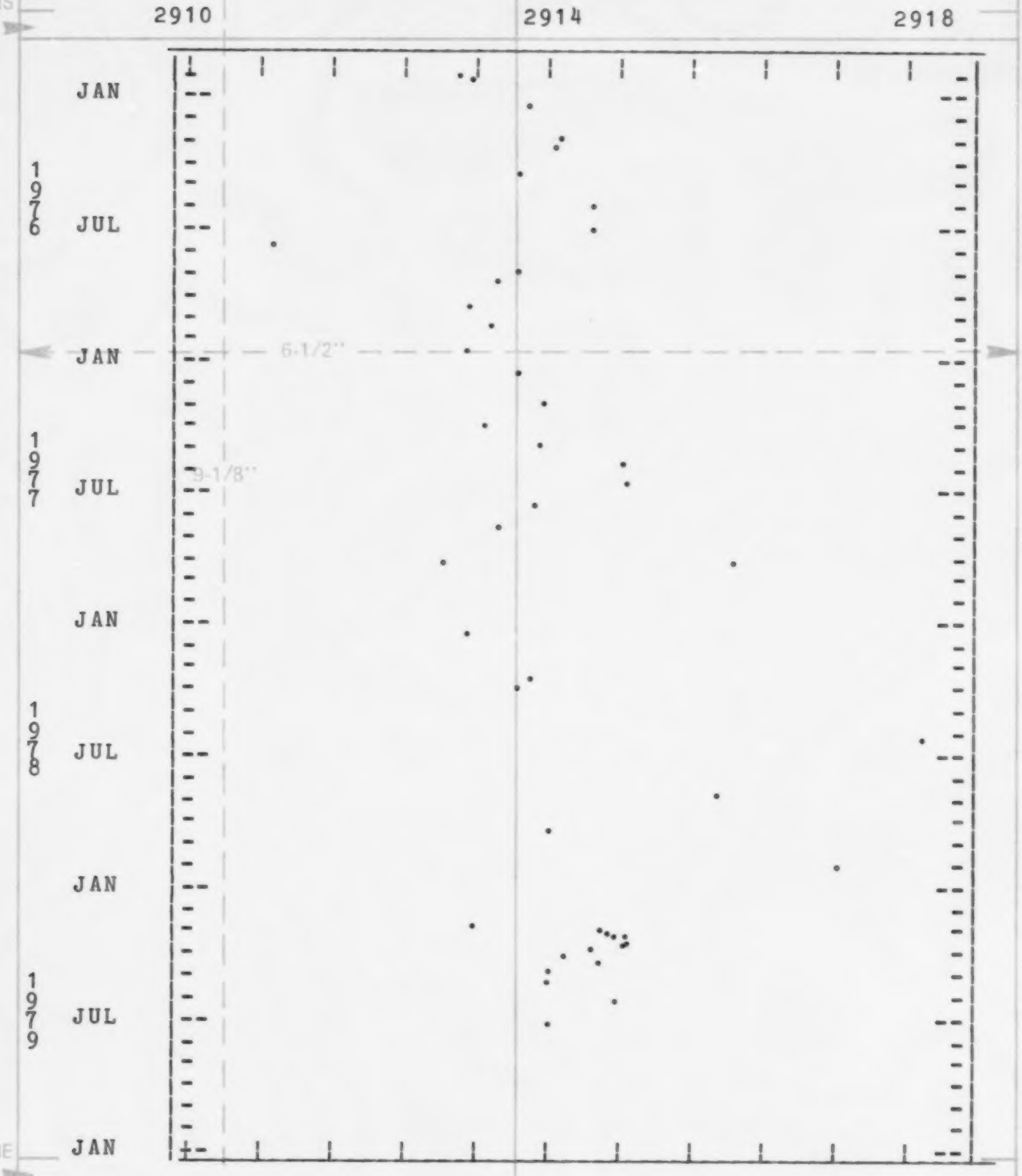
DATE	LEVEL	READING	CHANGE
4 16 1979	2914.28	40.72	-00.35
4 30 1979	2913.77	41.23	00.51
5 14 1979	2913.75	41.25	00.02
6 12 1979	2914.46	40.54	-00.71
7 13 1979	2913.77	41.23	00.69
8 7 1979	2913.28	41.72	00.49
9 7 1979	2913.45	41.55	-00.17
9 10 1979	2913.40	41.60	00.05
10 5 1979	2913.18	41.82	00.22

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL USGS1

WATER LEVEL (FEET ABOVE MSL)



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TOP OF IMAGE AREA
DROPPED HEAD; BEGIN SECTIONS HERE
6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET
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TOP OF IMAGE AREA
DROPPED HEAD: BEGIN SECTIONS HERE
6-1/2"
9-1/8"

LITHOLOGIC LOG

Well: NCRP #27
Date Completed: 7/13/76

DEPTH ft.	THICKNESS ft.	DESCRIPTION
0'-9'	9'	Clay, Brown, Damp
9'-10.5'	1.5'	Shale, Gray
10.5'-11'	.5'	Coal
11'-11.5'	.5'	Shale, Blue
11.5'-14'	2.5'	Coal
14'-24'	10'	Sandy Shale, Gray Siltstone, Gray
24'-34'	10'	Sandy Shale, Gray
34'-46'	12'	Siltstone, Gray, H_2O in hole at 40
46'-47'	1'	Sandy Shale, Gray
47'-53'	6'	Sandstone, Fine, Gray
53'-54'	1'	Sandstone, Hard, Gray
54'-64'	10'	Shale, Gray
64'-69.5'	5.5'	Coal, Black, Damp
69.5'-74.5'	5'	Shale, Gray
74.5'-75.5'	1'	Shale, Gray, Hard
75.5'-87'	11.5'	Shale, Gray
87'-89'	2'	Coal
89'-97'	8'	Shale, Gray

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

#27 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
97'-98.5'	1.5'	Sandstone, Fine, Hard
98.5'-104'	5.5'	H_2O 2 gal./min in hole at 98.5' Sandstone, Gray, Fine, Clayey
104'-105'	1'	Hard Layer Sandstone? Injected Water
105'-120'	15'	Shale, Gray, Soft to Hard
120'-120.5'	.5'	Siltstone, Gray
120.5'-122'	1.5'	Shale, Gray, Silty, Wet Cuttings
122'-160'	38'	Shale, Gray w/a few thin sandstone interbeds, silty shale 135'-145', 150' - 152' firmer layer shale, soft, clayey below 145', 157' - 159' siltstone, firm
160'-166'	6'	Shale, Silty, Soft
166'-175'	9'	Shale, Soft, Clayey
175'-186.5'	11.5'	Shale, Silty, Gray
186.5'187'	1.5'	Hard Streak
187'-197'	10'	Shale, Silty to Sandy, Gray
197'-218'	21'	Coal w/occasional gray shale partings
218'-223'	5'	Coal. H_2) 5 gal./min.
223'-240'	17'	Coal w/a few shale partings (223'-224' shale)

6-1/2"
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

#27 continued

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
240'-276'	36'	Coal, Black, Oily Mud, w/ shale partings (253'-254')
276'-283'	7'	Shale, Grayish-Brown to Gray

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP27

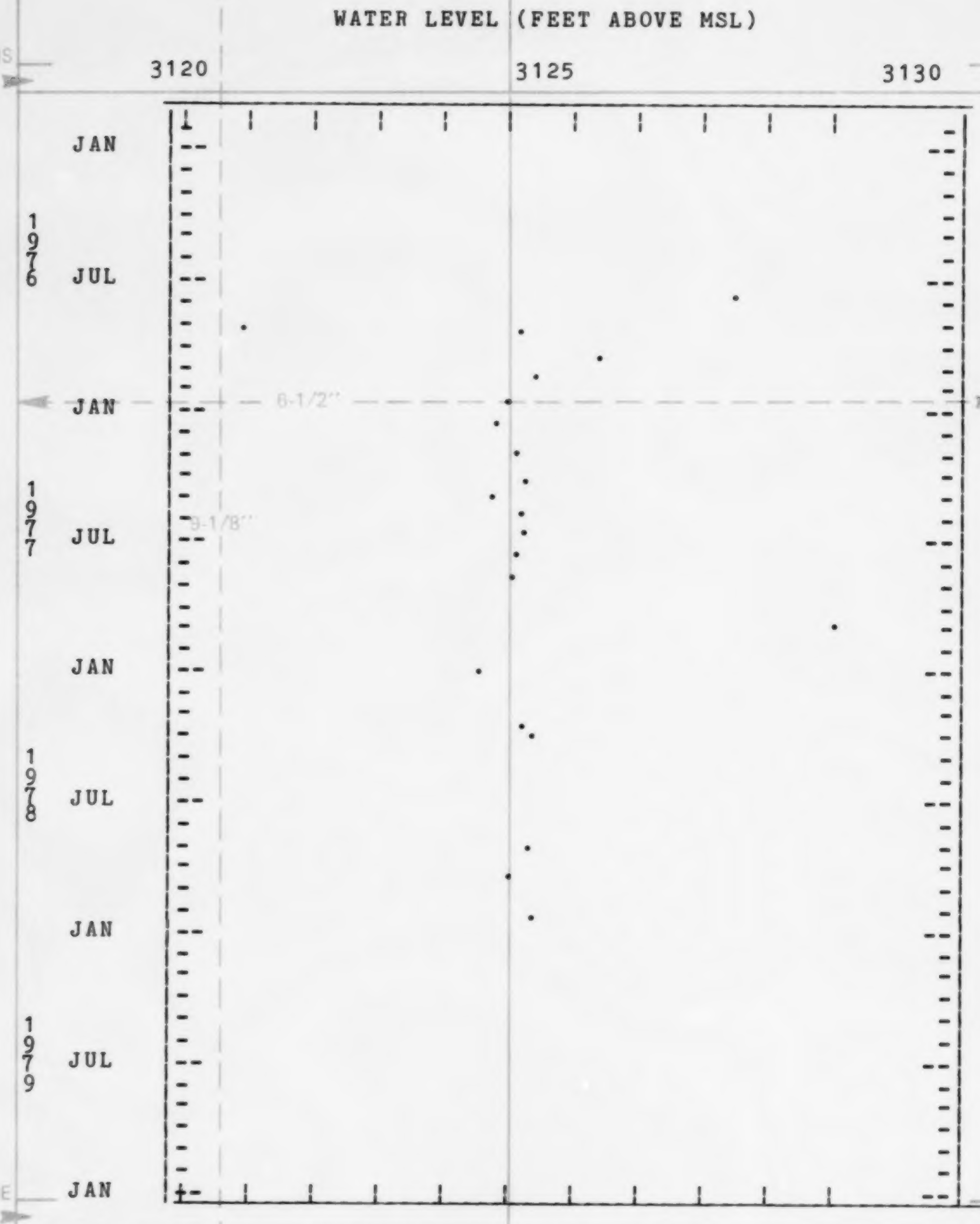
GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3380

DATE	LEVEL	READING	CHANGE
7 28 1976	3127.90	252.10	00.00
9 9 1976	3120.86	259.14	07.04
9 16 1976	3124.81	255.19	-03.95
10 20 1976	3125.96	254.04	-01.15
11 18 1976	3125.03	254.97	00.93
12 20 1976	3124.65	255.35	00.38
1 24 1977	3124.49	255.51	00.16
3 3 1977	3124.78	255.22	-00.29
4 11 1977	3124.90	255.10	-00.12
5 3 1977	3124.42	255.58	00.48
5 26 1977	3124.85	255.15	-00.43
6 22 1977	3124.88	255.12	-00.03
7 26 1977	3124.77	255.23	00.11
8 23 1977	3124.71	255.29	00.06
10 31 1977	3129.33	250.67	-04.62
1 5 1978	3124.25	255.75	05.08
3 21 1978	3124.86	255.14	-00.61
4 6 1978	3125.00	255.00	-00.14
9 6 1978	3124.95	255.05	00.05
10 16 1978	3124.69	255.31	00.26
12 15 1978	3125.01	254.99	-00.32
6 14 1979	3124.88	255.12	00.13

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP27



6-1/2''
9-1/8''
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

EPA-287 (Cin.)
(4-76)

WELL NCRP 27 1 of 2

DATE		091676	122076	041077	062277
POTASSIUM	PPM	20.00	15.00	14.00	12.00
SODIUM	PPM	1300	1083	1080	1040
CALCIUM	PPM	26.00	40.00	18.00	30.00
MAGNESIUM	PPM	10.00	25.00	14.00	5.00
SULFATE	PPM	1833	1706	1633	1533
CHLORIDE	PPM	18.00	9.00	13.00	15.00
CARBONATE	PPM	120	72.00	0.00	12.00
BICARBONATE	PPM	988	927	1013	1000
FLOURIDE	PPM	1.00	1.30	1.60	1.60
SILICON DIO	PPM	52.00	10.00	20.00	14.00
TOTAL P	PPM	0.06	0.01	0.30	0.03
NITRATE	PPM	1.00	1.00	0.43	0.10
POTASSIUM	EPM	0.51	0.38	0.36	0.31
SODIUM	EPM	56.55	47.11	46.98	45.24
CALCIUM	EPM	1.30	2.00	0.90	1.50
MAGNESIUM	EPM	0.82	2.06	1.15	0.41
SULFATE	EPM	38.16	35.52	34.00	31.92
CHLORIDE	EPM	0.51	0.25	0.37	0.42
CARBONATE	EPM	4.00	2.40	0.00	0.40
BICARBONATE	EPM	16.19	15.19	16.60	16.39
FLOURIDE	EPM	0.05	0.07	0.08	0.08
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		59.18	51.55	49.39	47.46
TOTAL ANIONS		58.78	53.37	50.96	49.10
DEVIATION		99.33	104	103	103
TDS (calc.)		3814	3407	3271	3140
TDS @180		3710	3583	3312	3156
TOTAL HARDNESS		104	203	101	93.00
ALKALINITY		1010	880	830	840
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		3500	4800	4900	4559
FIELD COND.					
LAB pH		9.30	8.40	8.10	8.30
FIELD pH			8.40	7.80	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 27 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	15.25	2.95	4.00
SODIUM	PPM	1126	102	4.00
CALCIUM	PPM	28.50	7.92	4.00
MAGNESIUM	PPM	13.50	7.37	4.00
SULFATE	PPM	1676	109	4.00
CHLORIDE	PPM	13.75	3.27	4.00
CARBONATE	PPM	51.00	48.28	4.00
BICARBONATE	PPM	982	32.96	4.00
FLOURIDE	PPM	1.37	0.25	4.00
SILICON DIO	PPM	24.00	16.55	4.00
TOTAL P	PPM	0.10	0.12	4.00
NITRATE	PPM	0.08	0.74	4.00
POTASSIUM	EPM	0.39		
SODIUM	EPM	48.97		
CALCIUM	EPM	1.42		
MAGNESIUM	EPM	1.11		
SULFATE	EPM	34.90		
CHLORIDE	EPM	0.39		
CARBONATE	EPM	1.70		
BICARBONATE	EPM	16.09		
FLOURIDE	EPM	0.07		
NITRATE	EPM	0.00		
TOTAL CATIONS		51.89	4.45	4.00
TOTAL ANIONS		53.05	3.64	4.00
DEVIATION		102	1.77	4.00
TDS (calc.)		3408	253	4.00
TDS @180		3440	218	4.00
TOTAL HARDNESS		125	45.07	4.00
ALKALINITY		890	71.76	4.00
NON-CARB HARD		0.00	0.00	4.00
LAB CONDUCTIVITY		4440	557	4.00
FIELD COND.		0.00	0.00	0.00
LAB pH		8.53	0.46	4.00
FIELD pH		8.10	0.30	2.00

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL TRW5

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2915

DATE	LEVEL	READING	CHANGE
10 9 1975	2871.02	43.98	00.00
10 16 1975	2871.04	43.96	-00.02
10 30 1975	2870.85	44.15	00.19
11 6 1975	2870.87	44.13	-00.02
11 13 1975	2870.74	44.26	00.13
11 19 1975	2870.67	44.33	00.07
11 26 1975	2870.91	44.09	-00.24
12 2 1975	2869.93	45.07	00.98
12 10 1975	2870.83	44.17	-00.90
1 16 1976	2870.73	44.27	00.10
3 1 1976	2870.70	44.30	00.03
3 17 1976	2870.50	44.50	00.20
4 21 1976	2860.33	54.67	10.17
6 2 1976	2870.92	44.08	-10.59
7 7 1976	2871.07	43.93	-00.15
7 27 1976	2870.95	44.05	00.12
9 9 1976	2871.13	43.87	-00.18
9 16 1976	2871.18	43.82	-00.05
10 20 1976	2871.13	43.87	00.05
11 18 1976	2870.89	44.11	00.24
12 20 1976	2871.58	43.42	-00.69
1 21 1977	2870.35	44.65	01.23
3 2 1977	2866.52	48.48	03.83
4 11 1977	2870.04	44.96	-03.52
5 2 1977	2865.79	49.21	04.25
5 26 1977	2869.70	45.30	-03.91
6 22 1977	2870.64	44.36	-00.94
7 26 1977	2870.73	44.27	-00.09
8 23 1977	2870.22	44.78	00.51
10 11 1977	2870.17	44.83	00.05
10 31 1977	2870.62	44.38	-00.45
1 12 1978	2870.50	44.50	00.12
3 21 1978	2869.87	45.13	00.63
4 6 1978	2870.80	44.20	-00.93
6 15 1978	2871.50	43.50	-00.70
8 31 1978	2867.02	47.98	04.48
10 16 1978	2870.80	44.20	-03.78
12 6 1978	2870.57	44.43	00.23
3 6 1979	2871.76	43.24	-01.19
3 27 1979	2870.74	44.26	01.02

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
6-1/2"
9-1/8"

EPA-287 (Cin.)
(4-76)

WELL TRW5

GROUNDWATER LEVELS (FEET--DATUM MSL)

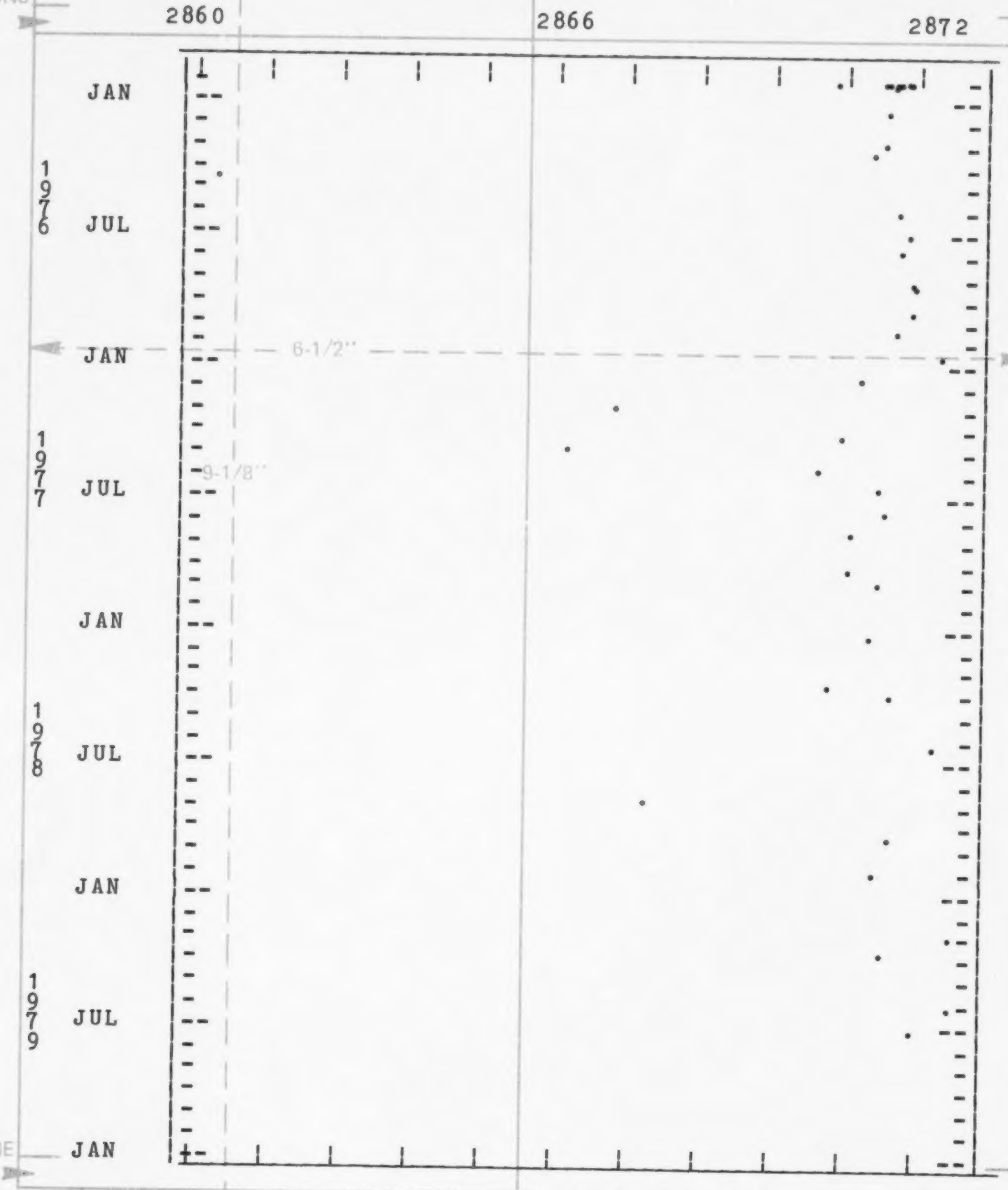
DATE	LEVEL	READING	CHANGE
6 12 1979	2871.78	43.22	-01.04
7 13 1979	2871.21	43.79	00.57
8 7 1979	2869.60	45.40	01.61

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL TRW5

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL TRW 5 1 of 2

DATE		120575	031776	070776	122076	041077
POTASSIUM	PPM	11.00	11.00	10.00	11.00	12.00
SODIUM	PPM	150	172	168	148	170
CALCIUM	PPM	68.00	67.00	64.00	82.00	68.00
MAGNESIUM	PPM	47.00	47.00	49.00	43.00	41.00
SULFATE	PPM	243	238	231	237	241
CHLORIDE	PPM	7.00	8.00	8.00	7.00	9.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	PPM	573	580	598	549	561
FLOURIDE	PPM	1.30	1.20	0.20	1.10	1.20
SILICON DIO	PPM	16.00	15.00	13.00	19.00	19.00
TOTAL P	PPM	0.20	0.10	0.04	0.04	0.02
NITRATE	PPM	0.10	1.00	2.00	1.00	0.10
POTASSIUM	EPM	0.28	0.28	0.26	0.28	0.31
SODIUM	EPM	6.52	7.48	7.31	6.44	7.39
CALCIUM	EPM	3.39	3.34	3.19	4.09	3.39
MAGNESIUM	EPM	3.87	3.87	4.03	3.54	3.37
SULFATE	EPM	5.06	4.96	4.81	4.93	5.02
CHLORIDE	EPM	0.20	0.23	0.23	0.20	0.25
CARBONATE	EPM	0.00	0.00	0.00	0.00	0.00
BICARBONATE	EPM	9.39	9.51	9.80	9.00	9.19
FLOURIDE	EPM	0.07	0.06	0.01	0.06	0.06
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		14.07	14.97	14.79	14.35	14.47
TOTAL ANIONS		14.67	14.69	14.79	14.14	14.46
DEVIATION		104	98.11	100	98.53	99.97
TDS (calc.)		816	828	824	798	817
TDS @180		846	836	833	853	808
TOTAL HARDNESS		365	361	359	382	338
ALKALINITY		470	475	490	450	460
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1220	1300	1200	1290	1340
FIELD COND.						
LAB pH		7.70	7.60	7.90	7.50	7.70
FIELD pH		6.60	7.10	6.60	7.00	6.80

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
9-1/8"
1/2"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL TRW 5 2 of 2

DATE		062277	101177	MEAN	ST.DEV	#
POTASSIUM	PPM	10.00	19.00	12.00	2.93	7.00
SODIUM	PPM	170	180	165	10.99	7.00
CALCIUM	PPM	67.00	66.00	68.86	5.51	7.00
MAGNESIUM	PPM	47.00	44.00	45.43	2.61	7.00
SULFATE	PPM	241	252	240	5.95	7.00
CHLORIDE	PPM	13.00	10.00	8.86	1.96	7.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	7.00
BICARBONATE	PPM	573	580	573	14.35	7.00
FLOURIDE	PPM	1.10	1.00	1.01	0.34	7.00
SILICON DIO	PPM	21.00	20.00	17.57	2.72	7.00
TOTAL P	PPM	0.05	0.07	0.05	0.08	7.00
NITRATE	PPM	0.10	0.10	0.03	0.93	7.00
POTASSIUM	EPM	0.26	0.49	0.31		
SODIUM	EPM	7.39	7.83	7.20		
CALCIUM	EPM	3.34	3.29	3.44		
MAGNESIUM	EPM	3.87	3.62	3.74		
SULFATE	EPM	5.02	5.25	5.01		
CHLORIDE	EPM	0.37	0.28	0.25		
CARBONATE	EPM	0.00	0.00	0.00		
BICARBONATE	EPM	9.39	9.51	9.40		
FLOURIDE	EPM	0.06	0.05	0.05		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		14.86	15.23	14.68	0.37	7.00
TOTAL ANIONS		14.74	15.01	14.64	0.26	7.00
DEVIATION		99.18	98.60	99.81	1.95	7.00
TDS (calc.)		830	856	824	16.32	7.00
TDS @180		830	806	830	16.43	7.00
TOTAL HARDNESS		361	347	359	12.86	7.00
ALKALINITY		470	475	470	11.65	7.00
NON-CARB HARD		0.00	0.00	0.00	0.00	7.00
LAB CONDUCTIVITY		1319	1254	1275	47.96	7.00
FIELD COND.			900	900	0.00	1.00
LAB pH		7.50	8.00	7.70	0.18	7.00
FIELD pH			8.50	7.10	0.65	6.00

LITHOLOGIC LOG

Well: NCRP #10 A-B
Date Completed: 4/8/76

DEPTH	THICKNESS	DESCRIPTION
ft.	ft.	
0'-91'	91'	Interbedded Sand, Gravel & Clay
91'-94'	3'	Sandstone

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP10A

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2880

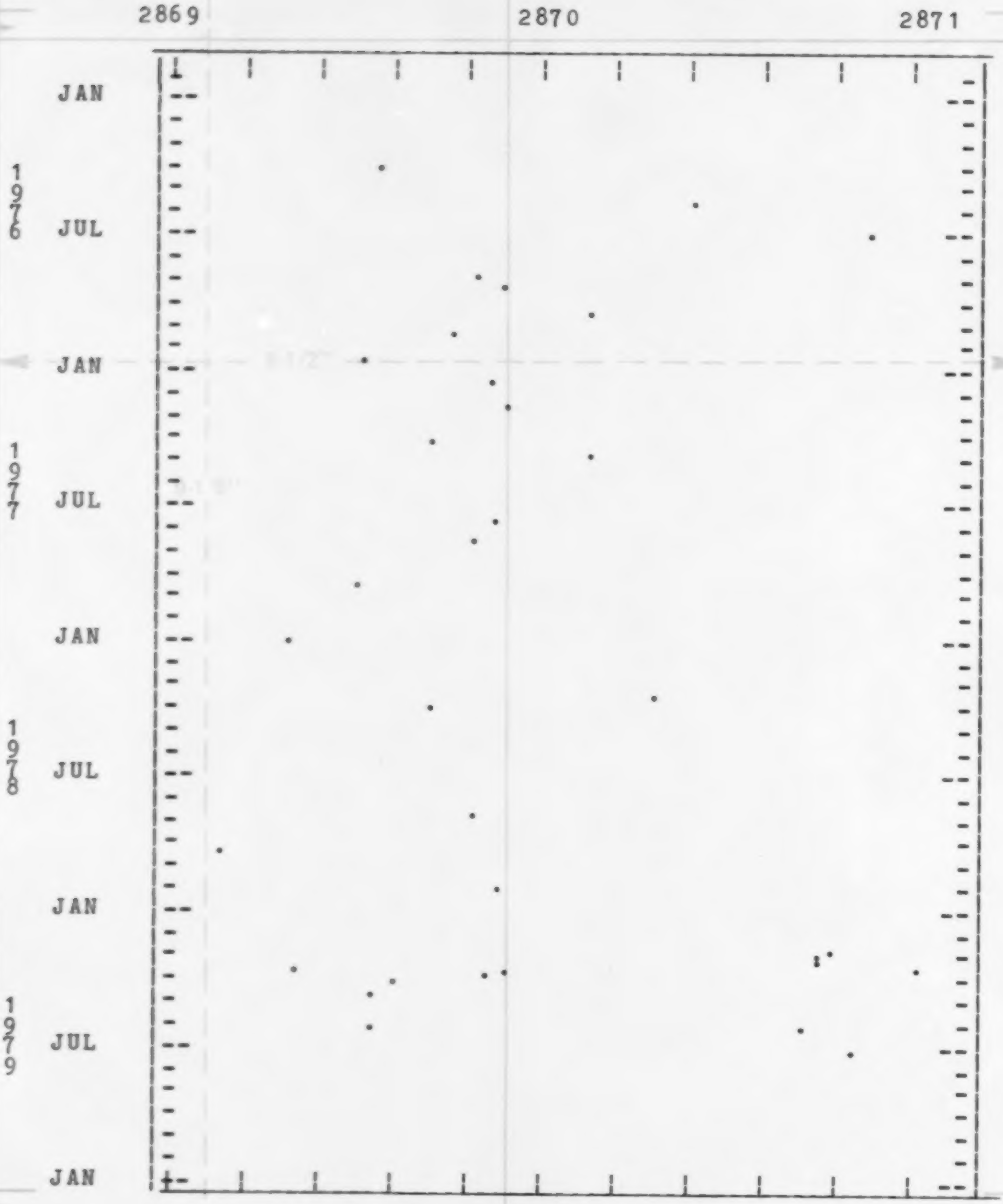
DATE	LEVEL	READING	CHANGE
4 9 1976	2869.60	10.40	00.00
5 27 1976	2870.40	9.60	-00.80
7 6 1976	2870.84	9.16	-00.44
9 2 1976	2869.85	10.15	00.99
9 16 1976	2869.92	10.08	-00.07
10 20 1976	2870.14	9.86	-00.22
11 18 1976	2869.79	10.21	00.35
12 20 1976	2869.56	10.44	00.23
1 20 1977	2869.89	10.11	-00.33
2 22 1977	2869.93	10.07	-00.04
4 11 1977	2869.74	10.26	00.19
5 2 1977	2870.14	9.86	-00.40
5 26 1977	2871.31	8.69	-01.17
6 22 1977	2871.04	8.96	00.27
7 27 1977	2869.90	10.10	01.14
8 24 1977	2869.84	10.16	00.06
10 22 1977	2869.55	10.45	00.29
1 5 1978	2869.38	10.62	00.17
3 21 1978	2870.30	9.70	-00.92
4 6 1978	2869.74	10.26	00.56
6 6 1978	2873.51	6.49	-03.77
8 31 1978	2869.84	10.16	03.67
10 16 1978	2869.21	10.79	00.63
12 6 1978	2869.91	10.09	-00.70
2 27 1979	2870.75	9.25	-00.84
3 6 1979	2870.72	9.28	00.03
3 15 1979	2870.72	9.28	00.00
3 22 1979	2870.97	9.03	-00.25
3 27 1979	2869.40	10.60	01.57
3 29 1979	2869.93	10.07	-00.53
3 30 1979	2869.88	10.12	00.05
4 9 1979	2869.65	10.35	00.23
4 25 1979	2869.59	10.41	00.06
6 12 1979	2869.59	10.41	00.00
6 12 1979	2870.68	9.32	-01.09
7 13 1979	2870.80	9.20	-00.12
8 7 1979	2869.77	10.23	01.03

6-1/2"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP10A

WATER LEVEL (FEET ABOVE MSL)



BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 10A

1 of 2

DATE		070776	122076	041077	062277
POTASSIUM	PPM	4.00	5.00	5.00	3.00
SODIUM	PPM	340	325	350	350
CALCIUM	PPM	7.00	6.00	4.00	4.00
MAGNESIUM	PPM	2.00	2.00	6.00	4.00
SULFATE	PPM	338	339	343	340
CHLORIDE	PPM	10.00	8.00	10.00	11.00
CARBONATE	PPM	0.00	0.00	24.00	0.00
BICARBONATE	PPM	500	488	439	476
FLOURIDE	PPM	2.10	1.90	2.10	1.80
SILICON DIO	PPM	5.00	8.00	7.00	8.00
TOTAL P	PPM	0.05	0.13	0.02	0.01
NITRATE	PPM	1.00	1.00	0.10	0.10
POTASSIUM	EPM	0.10	0.13	0.13	0.08
SODIUM	EPM	14.79	14.14	15.22	15.22
CALCIUM	EPM	0.35	0.30	0.20	0.20
MAGNESIUM	EPM	0.16	0.16	0.49	0.33
SULFATE	EPM	7.04	7.06	7.14	7.08
CHLORIDE	EPM	0.28	0.23	0.28	0.31
CARBONATE	EPM	0.00	0.00	0.80	0.00
BICARBONATE	EPM	8.19	8.00	7.20	7.80
FLOURIDE	EPM	0.11	0.10	0.11	0.09
NITRATE	EPM	0.00	0.00	0.00	0.00
TOTAL CATIONS		15.41	14.73	16.05	15.83
TOTAL ANIONS		15.55	15.32	15.46	15.20
DEVIATION		101	104	96.32	96.05
TDS (calc.)		947	925	958	946
TDS @180		942	968	948	918
TOTAL HARDNESS		27.00	25.00	34.00	24.00
ALKALINITY		410	400	400	390
NON-CARB HARD		0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1800	1500	1600	1513
FIELD COND.			9.00		
LAB pH		8.00	8.20	8.50	8.00
FIELD pH		8.00		7.50	

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 10A 2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	4.25	0.83	4.00
SODIUM	PPM	341	10.23	4.00
CALCIUM	PPM	5.25	1.30	4.00
MAGNESIUM	PPM	3.50	1.66	4.00
SULFATE	PPM	340	1.87	4.00
CHLORIDE	PPM	9.75	1.09	4.00
CARBONATE	PPM	6.00	10.39	4.00
BICARBONATE	PPM	476	22.85	4.00
FLOURIDE	PPM	1.98	0.13	4.00
SILICON DIO	PPM	7.00	1.22	4.00
TOTAL P	PPM	0.05	0.05	4.00
NITRATE	PPM	0.50	0.50	4.00
POTASSIUM	EPM	0.11		
SODIUM	EPM	14.84		
CALCIUM	EPM	0.26		
MAGNESIUM	EPM	0.29		
SULFATE	EPM	7.08		
CHLORIDE	EPM	0.28		
CARBONATE	EPM	0.20		
BICARBONATE	EPM	7.80		
FLOURIDE	EPM	0.10		
NITRATE	EPM	0.00		
TOTAL CATIONS		15.50	0.50	4.00
TOTAL ANIONS		15.38	0.13	4.00
DEVIATION		99.34	3.34	4.00
TDS (calc.)		944	11.94	4.00
TDS @180		944	17.83	4.00
TOTAL HARDNESS		27.50	3.91	4.00
ALKALINITY		400	7.07	4.00
NON-CARB HARD		0.00	0.00	4.00
LAB CONDUCTIVITY		1603	120	4.00
FIELD COND.		9.00	0.00	1.00
LAB pH		8.17	0.20	4.00
FIELD pH		7.75	0.25	2.00

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''
9-1/8''

EPA-287 (Cin.)
(4-76)

WELL NCRP10B

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2880

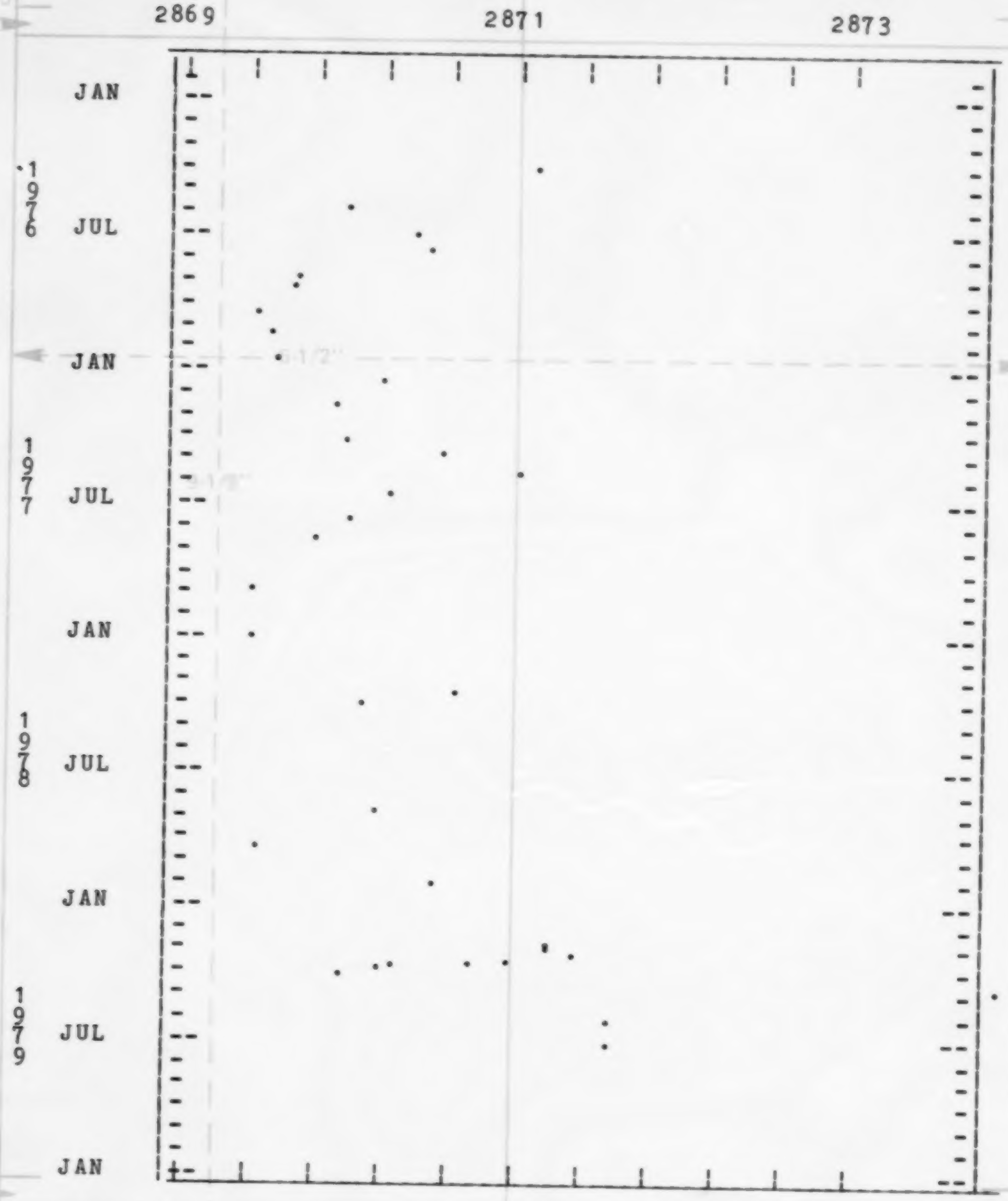
DATE	LEVEL	READING	CHANGE
4 9 1976	2871.13	8.87	00.00
5 29 1976	2870.08	9.92	01.05
7 6 1976	2870.46	9.54	-00.38
7 27 1976	2870.54	9.46	-00.08
9 2 1976	2869.80	10.20	00.74
9 16 1976	2869.78	10.22	00.02
10 20 1976	2869.58	10.42	00.20
11 18 1976	2869.66	10.34	-00.08
12 20 1976	2869.69	10.31	-00.03
1 20 1977	2870.28	9.72	-00.59
2 22 1977	2870.02	9.98	00.26
4 11 1977	2870.08	9.92	-00.06
5 2 1977	2870.62	9.38	-00.54
5 26 1977	2871.05	8.95	-00.43
6 22 1977	2870.33	9.67	00.72
7 27 1977	2870.10	9.90	00.23
8 24 1977	2869.91	10.09	00.19
10 31 1977	2869.56	10.44	00.35
1 5 1978	2869.56	10.44	00.00
3 21 1978	2870.70	9.30	-01.14
4 6 1978	2870.18	9.82	00.52
6 6 1978	2873.08	6.92	-02.90
8 31 1978	2870.26	9.74	02.82
10 16 1978	2869.60	10.40	00.66
12 5 1978	2870.58	9.42	-00.98
2 27 1979	2871.22	8.78	-00.64
3 6 1979	2871.22	8.78	00.00
3 15 1979	2871.36	8.64	-00.14
3 22 1979	2871.00	9.00	00.36
3 27 1979	2870.79	9.21	00.21
3 29 1979	2870.36	9.64	00.43
3 30 1979	2870.28	9.72	00.08
4 9 1979	2870.07	9.93	00.21
4 25 1979	2870.01	9.99	00.06
6 12 1979	2871.56	8.44	-01.55
7 13 1979	2871.56	8.44	00.00
8 7 1979	2870.20	9.80	01.36

BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL NCRP10B

WATER LEVEL (FEET ABOVE MSL)



6-1/2"

9-1/2"

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 10B 1 of 2

DATE		070776	122076	041077	062277	103177
POTASSIUM	PPM	9.00	6.00	8.00	6.00	7.00
SODIUM	PPM	130	130	120	103	90.00
CALCIUM	PPM	36.00	32.00	27.00	26.00	31.00
MAGNESIUM	PPM	36.00	36.00	36.00	33.00	48.00
SULFATE	PPM	197	171	173	138	188
CHLORIDE	PPM	13.00	7.00	8.00	9.00	8.00
CARBONATE	PPM	0.00	0.00	12.00	24.00	0.00
BICARBONATE	PPM	397	378	317	275	336
FLOURIDE	PPM	1.80	1.30	1.30	1.20	1.30
SILICON DIO	PPM	10.00	12.00	6.00	8.00	19.00
TOTAL P	PPM	0.01	0.17	0.04	0.20	0.01
NITRATE	PPM	1.00	2.00	0.50	0.10	0.10
POTASSIUM	EPM	0.23	0.15	0.20	0.15	0.18
SODIUM	EPM	5.65	5.65	5.22	4.48	3.91
CALCIUM	EPM	1.80	1.60	1.35	1.30	1.55
MAGNESIUM	EPM	2.96	2.96	2.96	2.71	3.95
SULFATE	EPM	4.10	3.56	3.60	2.87	3.91
CHLORIDE	EPM	0.37	0.20	0.23	0.25	0.23
CARBONATE	EPM	0.00	0.00	0.40	0.80	0.00
BICARBONATE	EPM	6.51	6.20	5.20	4.51	5.51
FLOURIDE	EPM	0.09	0.07	0.07	0.06	0.07
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		10.64	10.37	9.73	8.65	9.59
TOTAL ANIONS		10.97	9.97	9.43	8.43	9.66
DEVIATION		103	96.20	96.92	97.55	101
TDS (calc.)		616	568	540	474	537
TDS @180		624	612	527	480	559
TOTAL HARDNESS		236	228	217	200	274
ALKALINITY		325	310	280	265	275
NON-CARB HARD		0.00	0.00	0.00	0.00	0.00
LAB CONDUCTIVITY		1000	980	920	825	843
FIELD COND.						660
LAB pH		8.10	8.20	8.30	8.40	8.20
FIELD pH		7.30	7.00	6.50		8.00

WELL NCRP 10B

2 of 2

DATE		MEAN	ST.DEV	#
POTASSIUM	PPM	7.20	1.17	5.00
SODIUM	PPM	115	15.77	5.00
CALCIUM	PPM	30.40	3.61	5.00
MAGNESIUM	PPM	37.80	5.23	5.00
SULFATE	PPM	173	20.15	5.00
CHLORIDE	PPM	9.00	2.10	5.00
CARBONATE	PPM	7.20	9.60	5.00
BICARBONATE	PPM	341	43.50	5.00
FLOURIDE	PPM	1.38	0.21	5.00
SILICON DIO	PPM	11.00	4.47	5.00
TOTAL P	PPM	0.08	0.09	5.00
NITRATE	PPM	0.74	0.71	5.00
POTASSIUM	EPM	0.18		
SODIUM	EPM	4.99		
CALCIUM	EPM	1.52		
MAGNESIUM	EPM	3.11		
SULFATE	EPM	3.61		
CHLORIDE	EPM	0.25		
CARBONATE	EPM	0.24		
BICARBONATE	EPM	5.58		
FLOURIDE	EPM	0.07		
NITRATE	EPM	0.00		
TOTAL CATIONS		9.80	0.69	5.00
TOTAL ANIONS		9.69	0.82	5.00
DEVIATION		98.89	2.61	5.00
TDS (calc.)		547	46.22	5.00
TDS @180		560	53.46	5.00
TOTAL HARDNESS		231	24.66	5.00
ALKALINITY		291	22.67	5.00
NON-CARB HARD		0.00	0.00	5.00
LAB CONDUCTIVITY		914	70.35	5.00
FIELD COND.		660	0.00	1.00
LAB pH		8.24	0.10	5.00
FIELD pH		7.20	0.54	4.00

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-79)

WELL TRW7

GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 2880

DATE	LEVEL	READING	CHANGE
10 9 1975	2860.01	19.99	00.00
10 10 1975	2859.59	20.41	00.42
10 30 1975	2859.34	20.66	00.25
11 6 1975	2859.30	20.70	00.04
11 13 1975	2859.21	20.79	00.09
11 19 1975	2859.17	20.83	00.04
11 26 1975	2859.14	20.86	00.03
12 4 1975	2859.06	20.94	00.08
12 10 1975	2859.03	20.97	00.03
1 16 1976	2858.89	21.11	00.14
3 1 1976	2859.03	20.97	-00.14
1 16 1976	2858.89	21.11	00.14
3 1 1976	2859.03	20.97	-00.14
3 17 1976	2859.09	20.91	-00.06
4 21 1976	2858.92	21.08	00.17
6 2 1976	2858.84	21.16	00.08
7 7 1976	2857.81	22.19	01.03
7 27 1976	2859.49	20.51	-01.68
9 16 1976	2860.16	19.84	-00.67
10 20 1976	2859.54	20.46	00.62
11 18 1976	2859.19	20.81	00.35
12 20 1976	2858.92	21.08	00.27
1 21 1977	2858.82	21.18	00.10
3 2 1977	2858.59	21.41	00.23
4 11 1977	2858.93	21.07	-00.34
5 2 1977	2859.06	20.94	-00.13
5 26 1977	2858.93	21.07	00.13
6 22 1977	2859.67	20.33	-00.74
7 26 1977	2858.45	21.55	01.22
8 23 1977	2858.98	21.02	-00.53
10 11 1977	2856.42	23.58	02.56
10 31 1977	2858.31	21.69	-01.89
1 12 1977	2858.49	21.51	-00.18
4 6 1978	2859.51	20.49	-01.02
6 15 1978	2860.30	19.70	-00.79
8 31 1978	2860.77	19.23	-00.47
10 19 1978	2859.81	20.19	00.96
3 6 1979	2858.47	21.53	01.34
3 22 1979	2858.85	21.15	-00.38
6 12 1979	2858.56	21.44	00.29

6-1/2"

9-1/8"

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

WELL TRW7

GROUNDWATER LEVELS (FEET--DATUM MSL)

DATE	LEVEL	READING	CHANGE
7 13 1979	2859.82	20.18	-01.26
8 7 1979	2858.97	21.03	00.85

6-1/2"

9-1/8"

BEGIN LAST LINE OF TEXT

BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

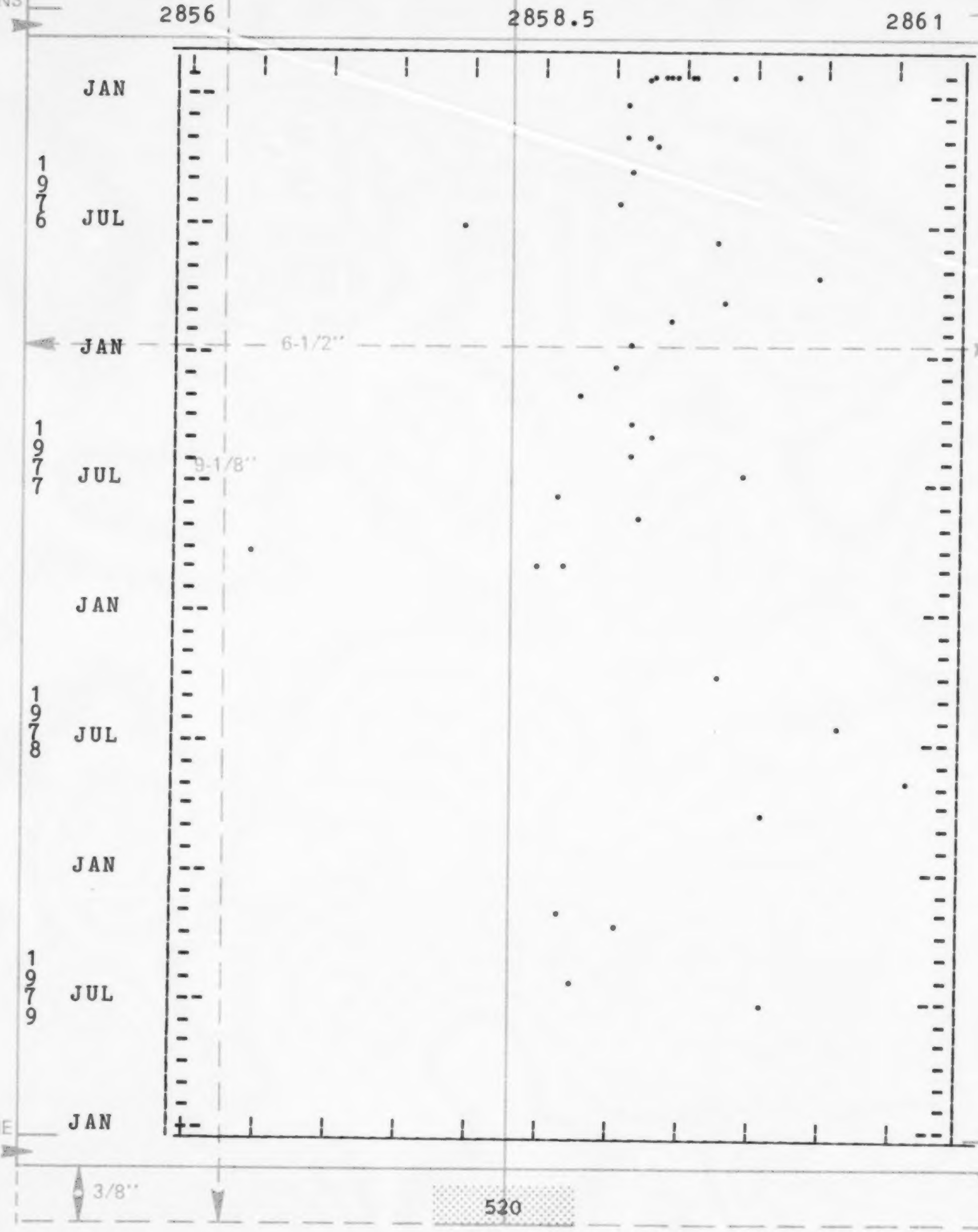
3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

HYDROGRAPH FOR WELL TRW7

WATER LEVEL (FEET ABOVE MSL)



6-1/2''
9-1/8''
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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8''

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL TRW #7 1 of 1

DATE		062277	101177	MEAN	ST.DEV	#
POTASSIUM	PPM	7.00	6.00	6.50	0.50	2.00
SODIUM	PPM	570	486	528	42.00	2.00
CALCIUM	PPM	85.00	70.00	77.50	7.50	2.00
MAGNESIUM	PPM	38.00	51.00	44.50	6.50	2.00
SULFATE	PPM	1106	1167	1136	30.50	2.00
CHLORIDE	PPM	16.00	15.00	15.50	0.50	2.00
CARBONATE	PPM	0.00	0.00	0.00	0.00	2.00
BICARBONATE	PPM	610	244	427	183	2.00
FLOURIDE	PPM	1.10	0.96	1.03	0.07	2.00
SILICON DIO	PPM	6.00	9.00	7.50	1.50	2.00
TOTAL P	PPM	0.11	0.05	0.08	0.03	2.00
NITRATE	PPM	0.10	1.00	0.55	0.45	2.00
POTASSIUM	EPM	0.18	0.15	0.17		
SODIUM	EPM	24.79	21.14	22.97		
CALCIUM	EPM	4.24	3.49	3.87		
MAGNESIUM	EPM	3.13	4.20	3.66		
SULFATE	EPM	23.03	24.30	23.66		
CHLORIDE	EPM	0.45	0.42	0.44		
CARBONATE	EPM	0.00	0.00	0.00		
BICARBONATE	EPM	10.00	4.00	7.00		
FLOURIDE	EPM	0.06	0.05	0.05		
NITRATE	EPM	0.00	0.00	0.00		
TOTAL CATIONS		32.34	28.98	30.66	1.68	2.00
TOTAL ANIONS		33.42	28.66	31.04	2.38	2.00
DEVIATION		103	98.89	101	2.22	2.00
TDS (calc.)		2122	1915	2018	103	2.00
TDS @180		2129	2186	2157	28.50	2.00
TOTAL HARDNESS		367	385	376	9.00	2.00
ALKALINITY		500	200	350	150	2.00
NON-CARB HARD		0.00	185	92.50	92.50	2.00
LAB CONDUCTIVITY		3104	3038	3071	32.98	2.00
FIELD COND.			2200	2200	0.00	1.00
LAB pH		7.90	8.20	8.05	0.15	2.00
FIELD pH			7.45	7.45	0.00	1.00

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

LITHOLOGIC LOG

Well: NCRP #21
Date Completed: 4/7/76

DEPTH	**THICKNESS**	**DESCRIPTION**
ft.	ft.	
0'15'	15'	Brown, Clay
15'-25'	10'	Sandy Gravel
25'-58'	33'	Sandy Gravel
58'-65'	7'	Coal
65'-67'	2'	Sandstone, Coal
67'-72'	5'	Gray, Shale
72'-73'	1'	Sandy Shale, Coal
73'-78'	5'	Shale
78'-79'	1'	Coal
79'-91'	12'	Gray Shale
91'-117'	26'	Coal
117'-118'	1'	Gray Shale

6-1/2"
9-1/8"
BEGIN LAST LINE OF TEXT
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

TYPING GUIDE SHEET

1 of 1

WELL NCRP21

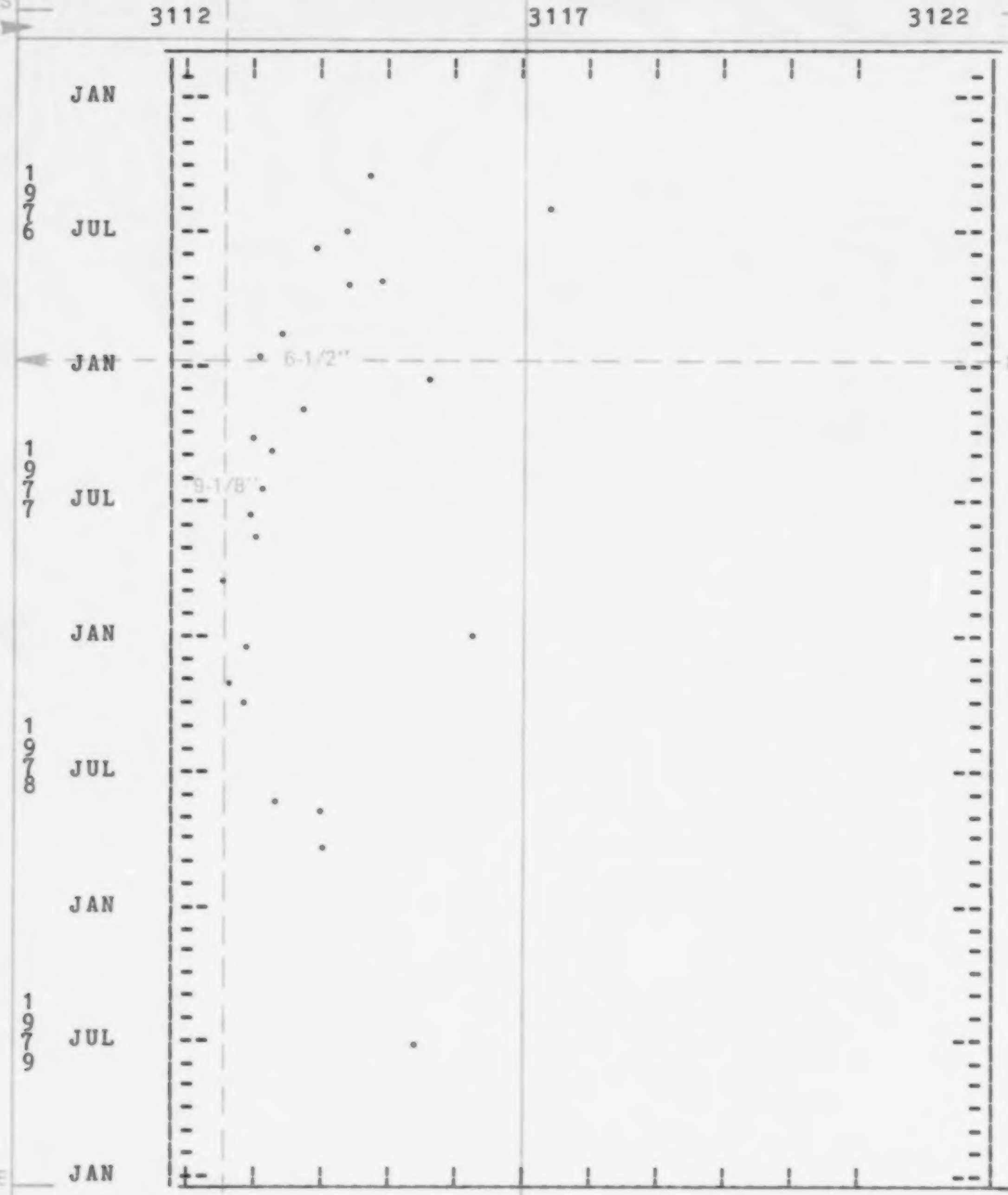
GROUNDWATER LEVELS (FEET--DATUM MSL)

elevation at top of well casing is 3210

DATE	LEVEL	READING	CHANGE
4 22 1976	3114.55	95.45	00.00
6 2 1976	3117.03	92.97	-02.48
7 7 1976	3114.22	95.78	02.81
7 28 1976	3113.80	96.20	00.42
9 9 1976	3114.71	95.29	-00.91
9 16 1976	3114.27	95.73	00.44
11 19 1976	3113.31	96.69	00.96
12 20 1976	3113.03	96.97	00.28
1 21 1977	3115.38	94.62	-02.35
3 2 1977	3113.63	96.37	01.75
4 11 1977	3112.93	97.07	00.70
5 2 1977	3113.19	96.81	-00.26
6 20 1977	3113.07	96.93	00.12
7 26 1977	3112.89	97.11	00.18
8 23 1977	3112.97	97.03	-00.08
10 11 1977	3122.62	87.38	-09.65
10 22 1977	3112.52	97.48	10.10
1 5 1978	3115.97	94.03	-03.45
1 20 1978	3112.84	97.16	03.13
3 7 1978	3112.61	97.39	00.23
4 6 1978	3112.80	97.20	-00.19
6 75 1978	3113.25	96.75	-00.45
8 31 1978	3113.87	96.13	-00.62
10 16 1978	3113.90	96.10	-00.03
7 12 1979	3115.18	94.82	-01.28
8 7 1979	3115.22	94.78	-00.04

HYDROGRAPH FOR WELL NCRP21

WATER LEVEL (FEET ABOVE MSL)



6-1/2"
9-1/8"
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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

WELL NCRP 21A

1 of 2

DATE		071576	091676	122076	041077	062077
POTASSIUM	PPM	10.00	10.00	15.00	16.00	17.00
SODIUM	PPM	170	154	280	590	570
CALCIUM	PPM	94.00	192	220	133	122
MAGNESIUM	PPM	67.00	25.00	24.00	73.00	64.00
SULFATE	PPM	505	519	822	1354	1269
CHLORIDE	PPM	10.00	14.00	8.00	13.00	17.00
CARBONATE	PPM	0.00	36.00	0.00	0.00	0.00
BICARBONATE	PPM	470	427	537	610	586
FLOURIDE	PPM	0.60	0.60	0.60	0.49	0.46
SILICON DIO	PPM	10.00	13.00	14.00	13.00	12.00
TOTAL P	PPM	0.04	0.01	0.17	0.02	0.03
NITRATE	PPM	1.00	1.00	1.00	0.10	0.40
POTASSIUM	EPM	0.26	0.26	0.38	0.41	0.43
SODIUM	EPM	7.39	6.70	12.18	25.66	24.79
CALCIUM	EPM	4.69	9.58	10.98	6.64	6.09
MAGNESIUM	EPM	5.51	2.06	1.97	6.00	5.26
SULFATE	EPM	10.51	10.81	17.11	28.19	26.42
CHLORIDE	EPM	0.28	0.39	0.23	0.37	0.48
CARBONATE	EPM	0.00	1.20	0.00	0.00	0.00
BICARBONATE	EPM	7.70	7.00	8.80	10.00	9.60
FLOURIDE	EPM	0.03	0.03	0.03	0.03	0.02
NITRATE	EPM	0.00	0.00	0.00	0.00	0.00
TOTAL CATIONS		17.85	18.59	25.52	38.72	36.58
TOTAL ANIONS		18.46	19.33	26.12	38.48	36.40
DEVIATION		103	104	102	99.40	99.51
TDS (calc.)		1087	1160	1633	2479	2347
TDS @180		1067	1067	1672	2428	2341
TOTAL HARDNESS		511	582	647	629	567
ALKALINITY		385	410	440	500	480
NON-CARB HARD		126	172	207	129	87.00
LAB CONDUCTIVITY		1800	1400	2350	3400	3298
FIELD COND.						
LAB pH		7.90	8.50	7.70	7.60	7.70
FIELD pH		7.20			6.90	

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

WELL NCRP 21A

DATE		102277	MEAN	ST.DEV	#
POTASSIUM	PPM	16.00	14.00	2.89	6.00
SODIUM	PPM	570	389	192	6.00
CALCIUM	PPM	124	147	43.80	6.00
MAGNESIUM	PPM	72.00	54.17	21.19	6.00
SULFATE	PPM	1296	961	362	6.00
CHLORIDE	PPM	20.00	13.67	4.03	6.00
CARBONATE	PPM	0.00	6.00	13.42	6.00
BICARBONATE	PPM	610	540	70.23	6.00
FLOURIDE	PPM	0.42	0.53	0.07	6.00
SILICON DIO	PPM	13.00	12.50	1.26	6.00
TOTAL P	PPM	0.01	0.04	0.06	6.00
NITRATE	PPM	6.50	0.63	2.68	6.00
POTASSIUM	EPM	0.41	0.36		
SODIUM	EPM	24.79	16.92		
CALCIUM	EPM	6.19	7.36		
MAGNESIUM	EPM	5.92	4.46		
SULFATE	EPM	26.98	20.00		
CHLORIDE	EPM	0.56	0.39		
CARBONATE	EPM	0.00	0.20		
BICARBONATE	EPM	10.00	8.85		
FLOURIDE	EPM	0.02	0.03		
NITRATE	EPM	0.00	0.00		
TOTAL CATIONS		37.31	29.10	8.81	6.00
TOTAL ANIONS		37.42	29.37	8.44	6.00
DEVIATION		100	101	1.83	6.00
TDS (calc.)		2398	1851	584	6.00
TDS @180		2413	1831	598	6.00
TOTAL HARDNESS		607	590	44.52	6.00
ALKALINITY		500	452	44.32	6.00
NON-CARB HARD		107	138	40.22	6.00
LAB CONDUCTIVITY		3234	2580	782	6.00
FIELD COND.		2400	2400	0.00	1.00
LAB pH		7.80	7.87	0.30	6.00
FIELD pH			7.05	0.15	2.00

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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

SUMMARY OF PUMP TEST DATA FROM MONITORING WELLS ON THE NORTHERN CHEYENNE RESERVATION.

Aquifer	# of Test	Length of Tests days	Saturated Thickness		Storage Coefficient	Transmissivity		Hydraulic Conductivity	
			m	ft		m^2/day	ft^2/day	m/day	ft/day
Anderson Coal									
NCRP 4	1	0.03	20.4	67	7x10^{-5}	1	11	0.05	0.2
NCRP 22	1	0.08	12.2	40	4x15^{-5}	0.5	5	0.04	0.1
NCRP 24	1	0.02	9.8	32	3x10^{-5}	1	13	0.02	0.4
Average	3	0.04	14.1	46	5x10^{-5}	1	10	0.07	0.23
range		0.8-0.2				1-0.5	14-5	0.1-0.04	0.4-0.12
Knobloch Coal									
NCRP 8A	1	0.4	18.3	60	6x10^{-5}	9	98	0.5	1.6
NCRP 21A	1	0.02	7.9	26	3x10^{-5}	2	24	0.3	0.9
NCRP 30A	1	0.01	10.1	33	3x10^{-5}	11	120	0.9	2.9
NCRP 29A	1	0.01	22.6	74	7x10^{-5}	17	187	0.8	2.5
Average	4	0.02	14.7	48	6x10^{-5}	3	70	0.6	2.01
range		0.04-0.01				17-3	187-24	0.9-0.3	3-0.9
Rosebud-McKay Coal									
NCRP 18	1	0.02	2.0	6	0.6x10^{-5}	0.07	0.7	0.03	0.1
CNRP 40A	1	0.01	2.0	7	0.7x10^{-5}	15	160	7	23
Average	2	0.015	2.0	6.5	0.65x10^{-5}	22	81	3.5	11.5
		0.02-0.01				15-0.07	160-0.7	7-0.3	23-0.1
Robinson Coal									
NCRP 35A	1	0.04	4.6	15	1x10^{-5}	1	12	0.4	0.8
Local Coal below Rosebud McKay Coal									
NCRP 20A	1	0.01	0.9	3	0.3x10^{-5}	1	16	2	5
NCRP 9A	1	0.02	1.2	4	0.4x10^{-5}	4	48	4	12
average	2	0.015	1.0	3.5	0.35x10^{-5}	3	32	2.7	9
range		0.07-0.01				4-1	48-16	4-2	12-5
Clinker									
NCRP 3	1	0.01	10.4	34	0.1	0.5	5	0.04	0.1

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

3/8"

PAGE NUMBER

EPA-287 (Cin.)
(4-76)

SPRINGS ON THE NORTHERN CHEYENNE RESERVATION

SPRING LOCATION	NAME	MAJOR AQUIFER	WATER BEARING MATERIAL OR SOURCE	FLOW (GPM)	LAND SURFACE ELEVATION (Ft.msl)
SESENW, Sec. 23; T2S, R38E	Red Robe Spring				
NESWNW, Sec. 9; T2S, R39E	White Bird Spring				
NWSE, Sec. 31; T2S, R41E	* Sweet Medicine Spring	TFr	-	Trace	3380
SESWSW, Sec. 13; T2S, R42E	* Netse Spring	-	-	9.4	3800
SESWSW, Sec. 13; T2S, R42E	Wolf Chief Spring	TFr	SS	Dry	3800
SWSENE, Sec. 23; T2S, R42E	Wolf On The Hill Srping	-	-	13.0	3918
NENWNE, Sec. 26; T2S, R42E	* Diamond R. Spring #1	TFr	CLR	5.03	4070
NWNWNW, Sec. 26; T2S, R42E	* Sits In The Night Spring	TFr	CLR	2.5	4260
NWSESW, Sec. 27; T2S, R42E	* Buffalo Jump Spring	TFr	CLR	15	4120
SWNWSW, Sec. 35; T2S, R42E	* Crazy Head Spring	TFr	CLR	92.7	4100
SWSWNE, Sec. 7; T2S, R43E	Bigfoot Spring	TFr	-	None	3640
SWNESW, Sec. 18; T2S, R43E	Roman Nose Spring	-	-	Less then 0.1	3740
SWSWNE, Sec. 19; T2S, R43E	* Coal Bear Spring	TFr	CLR	0.7	3860
NWNWSE, Sec. 30; T2S, R43E	* Porcupine Spring	TFr	CLR	18.95	4170
NWNWNW, Sec. 31; T2S, R43E	* Black Coyote Spring	TFr	CLR	31.3	4200
NENWNW, Sec. 31; T2S, R43E	* Black Kettle Spring	TFr	CLR	20.07	4110
SWNWNW, Sec. 27; T3S, R40E	Buffalo Horn Spring	-	SS	5	3540
NENENW, Sec. 33; T3S, R40E	Red Hair Spring	-	SS	0.33	3860
NESWNW, Sec. 9; T3S, R41E	* Rusty Spring #1				
SENWSE, Sec. 10; T3S, R41E	* Sweet Medicine Spring #2				
NWNE, Sec. 17; T3S, R42E	* White Antelope Spring	-	CLR	25	3050
SESW, Sec. 18; T3S, R42E	* Wolf Voice Spring	TFr	-	1.3	3760
NENW, Sec. 28; T3S, R42E	* Spang Spring	TFr	-	2.2	3860
NENW, Sec. 34; T3S, R42E	Morning Star Spring	TFr	-	0.25	4000
SENESW, Sec. 13; T4S, R39E	* Three Bears Spring	-	C	1.12	4160
SWSESE, Sec. 24; T4S, R39E	Badhorse Spring	-	SS	0.1	4460
NWSWSE, Sec. 25; T4S, R39E	* Red Bird Spring	TFr	-	3	4440
NENENE, Sec. 27; T4S, R39E	* Birdseye Spring	Qal.	-	18	3960
NESWSE, Sec. 28; T4S, R39E	CC Spring	TFr	-	5	4020
NWSESE, Sec. 17; T4S, R40E	Horse Roads Spring	Qal.	-	5	3890
Corner, Secs. 17,18,19,20; T4S, R40E	* Blackwolf Spring	-	CLR	3-5	4120
NENESE, Sec. 21; T4S, R40E	* Hardrobe Spring	Qal.	-	Trace	3980
NWSWNE, Sec. 21; T4S, R40E	Crazy Horse Spring	Qal.	-	Less than 1	3940
NWSENW, Sec. 27; T4S, R40E	Sweet Taste Woman Spring	Qal.	-	Trace	4070
NWSESE, Sec. 31; T4S, R40E	* Machoo Spring	TFr	SS	0.1	4315
NWSWNW, Sec. 31; T4S, R40E	* Box Elder Spring	TFr	-	20	4410

EPA-287 (Cin.)
(4-76)

SPRINGS ON THE NORTHERN CHEYENNE RESERVATION (continued)

SPRING LOCATION	NAME	MAJOR AQUIFER	WATER BEARING MATERIAL OR SOURCE	FLOW (GPM)	LAND SURFACE ELEVATION (Ft.msl)
NENW, Sec. 11; T4S, R41E	* Bixby Spring	TFr	CLR	26.5	4020
SENW, Sec. 11; T4S, R41E	* Old Bear Spring	TFr	CLR	25	4060
SESE, Sec. 15; T4S, R41E	Black Moccasins Spring	TFr	-	-	4260
SENW, Sec. 24; T4S, R41E	* B Hart Spring	Qal.	-	5.15	4040
NWNW, Sec. 26; T4S, R41E	Magpie Eagle Spring	TFr	-	Dry	4160
NENW, Sec. 26; T4S, R41E	Black Moon Spring	Qal.	-	Dry	4140
NESW, Sec. 27; T4S, R41E	* White Frog Spring	TFr	-	5.75	4220
NWSW, Sec. 27; T4S, R41E	* Yellow Nose Spring	TFr	-	0.5	4160
NWNE, Sec. 36; T4S, R41E	Canyon Springs	TFr	-	Trickle	3880
SENE, Sec. 4; T4S, R42E	* Station Spring	TFr	CLR	11.4	4060
SENW, Sec. 10; T4S, R42E	Red Armed Panther Spring	TFr	-	0.5	3985
NWSE, Sec. 16; T4S, R42E	* Wolf Tooth Spring	TFr	-	1.7	3680
NENE, Sec. 20; T4S, R42E	* Elliot Spring	TFr	CLR	3.4	3740
SWSE, Sec, 22; T4S, R42E	Little Shield Spring	TFr	C	0.8	3480
NWNE, Sec. 26; T4S, R42E	* Black Bird Spring	TFr	C	0.9	3380
NESWNW, Sec. 26; T4S, R42E	White Wolf Spring	TFr	-	Seep	-
NENWSW, Sec. 14; T5S, R39E	Honoxeaso Hohemee	TFr	SS	Trace	4061
NWNENW, Sec. 5; T5S, R40E	Aenehe Spring	TFr	SS	Trace	4300
NWSESW, Sec. 6; T5S, R40E	Great Eyes Spring	TFr	SS,SH	Seep	4[illegible]70
SWSWNE, Sec. 6; T5S, R40E	* Killsnight Spring	TFr	-	0.5	4360
NENWNE, Sec. 6; T5S, R40E	* Cut Nose Spring	TFr	SS	6.18	4335
NESENW, Sec. 7; T5S, R40E	Nedicine Water Spring	TFr	SS	Seep	4460
SENENE, Sec. 9; T5S, R40E	* Heneoxaaketa Spring	TFr	SS	1.88	4450
NWSWNW, Sec. 18; T5S, R40E	Voaxaae Spring	TFr	-	0.22	4480
SWNENW, Sec. 18; T5S, R40E	* White Bull Spring	TFr	-	0.56	4420
NWNE, Sec. 1; T5S, R41E	* Black Eable Spring	TFr	-	8.2	3700
NWNE, Sec. 1; T5S, R42E	White Shield Spring	TFr	C	Trickle	3280
SWNE, Sec. 6; T5S, R42E	Bobtail Horse Spring	TFr	-	Trace	3610

Note: Those springs indicated by an asterisk were sampled for water quality. The analyses are listed on the following pages.

EPA-287 (Cin.)
(4-76)

Sweet Medicine Spring

Submitted 8-4-77
Sampled 8-2-77 @ 1730

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	7
Sodium	53
Calcium	47
Magnesium	65
Sulfate	247
Chloride	9
Carbonate	0
Bicarbonate	323
Total Dissolved Solids, Calculated	587
Total Dissolved Solids @ 180°C	660
Standard Deviation of Anion-Cation Balance	1.86 Sigma
Fluoride	2.0
Silica (SiO_2)	23
Nitrate (NO_3)	7.4
Total Phosphorus as P	0.10
Total Hardness as $CaCO_3$	385
Alkalinity as $CaCO_3$	265
Non-Carbonate Hardness as $CaCO_3$	120
Conductivity @ 25°C	972 micromhos/cm.
pH ------- 7.7	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0001
Lead	<0.010
Arsenic	0.022
Selenium	<0.002
Aluminum	0.17
Vanadium	0.330
Strontium	3.2
Manganese	<0.01
Iron	0.04
Lithium	0.05

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Netse Spring

Submitted 8-5-77
Sampled 8-4-77 @ 1230

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	12
Sodium	40
Calcium	165
Magnesium	111
Sulfate	388
Chloride	9
Carbonate	0
Bicarbonate	634
Total Dissolved Solids, Calculated	1,037
Total Dissolved Solids @ 180°C	1,085
Standard Deviation of Anion-Cation Balance	-1.80 Sigma
Fluoride	0.25
Silica (SiO_2)	14
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.13
Total Hardness as $CaCO_3$	869
Alkalinity as $CaCO_3$	520
Non-Carbonate Hardness as $CaCO_3$	349
Conductivity @ 25°C	1,490 micromhos/cm
pH	7.8
Filtered and Acidified	
Copper	<0.02
Mercury	<0.0002
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.27
Vanadium	<0.010
Strontium	1.6
Manganese	0.05
Iron	0.08
Lithium	0.05

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Diamond R. Spring #1

Temp. 9.5 Salinity Conductivity micromhos/cm.

Field pH

Submitted 8-4-77

Sampled 8-2-77

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	3
Sodium	8
Calcium	79
Magnesium	28
Sulfate	27
Chloride	6
Carbonate	0
Bicarbonate	360
Total Dissolved Solids, Calculated	328
Total Dissolved Solids @ 180°C	374
Standard Deviation of Anion-Cation Balance	-0.27 Sigma
Fluoride	0.44
Silica (SiO_2)	22
Nitrate (NO_3)	0.9
Total Phosphorus as P	0.12
Total Hardness as $CaCO_3$	313
Alkalinity as $CaCO_3$	295
Non-Carbonate Hardness as $CaCO_3$	18
Conductivity @ 25°C	605 micromhos/cm.
pH	7.3
Filtered and Acidified	
Copper	<0.02
Mercury	0.0007
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.23
Vanadium	<0.010
Strontium	0.68
Manganese	0.02
Iron	0.08
Lithium	0.01

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3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Sits In The Night Spring

Submitted 8-4-77
Sampled 8-2-77

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	3
Sodium	9
Calcium	39
Magnesium	24
Sulfate	9
Chloride	5
Carbonate	0
Bicarbonate	244
Total Dissolved Solids, Calculated	209
Total Dissolved Solids @ 180°C	273
Standard Deviation of Anion-Cation Balance	-0.33 Sigma
Fluoride	1.0
Silica (SiO_2)	27
Nitrate (NO_3)	0.4
Total Phosphorus as P	0.04
Total Hardness as $CaCO_3$	195
Alkalinity as $CaCO_3$	200
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	422 micromhos/cm.
pH 7.7	
Filtered and Acidified	
Copper	0.02
Mercury	0.0004
Lead	<0.010
Arsenic	0.004
Selenium	<0.002
Aluminum	0.16
Vanadium	0.026
Strontium	0.57
Manganese	<0.01
Iron	0.03
Lithium	0.05

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Buffalo Jump Spring

Submitted 8-4-77
Sampled 8-2-77

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	10
Calcium	49
Magnesium	24
Sulfate	14
Chloride	6
Carbonate	0
Bicarbonate	252
Total Dissolved Solids, Calculated	237
Total Dissolved Solids @ 180°C	253
Standard Deviation of Anion-Cation Balance	-1.18 Sigma
Fluoride	0.94
Silica (SiO_2)	26
Nitrate (NO_3)	0.7
Total Phosphorus as P	0.52
Total Hardness as $CaCO_3$	220
Alkalinity as $CaCO_3$	215
Non-Carbonate Hardness as $CaCO_3$	5
Conductivity @ 25°C	432 micromhos/cm.
pH ------- 8.2	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0003
Lead	<0.010
Arsenic	0.008
Selenium	<0.002
Aluminum	0.17
Vanadium	0.050
Strontium	0.84
Manganese	0.02
Iron	0.02
Lithium	0.03

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Crazy Head Spring

Submitted 8-4-77
Sampled 8-2-77

CONSTITUENT	PARTS PER MILLION	
Filtered Only		
Potassium	1	
Sodium	13	
Calcium	43	
Magnesium	27	
Sulfate	23	
Chloride	5	
Carbonate	0	
Bicarbonate	268	
Total Dissolved Solids, Calculated	244	
Total Dissolved Solids @ 180°C	289	
Standard Deviation of Anion-Cation Balance	0.28	Sigma
Fluoride	1.2	
Silica (SiO_2)	26	
Nitrate (NO_3)	0.8	
Total Phosphorus as P	0.24	
Total Hardness as $CaCO_3$	220	
Alkalinity as $CaCO_3$	220	
Non-Carbonate Hardness as $CaCO_3$	0	
Conductivity @ 25°C	461	micromhos/cm.
pH	7.6	
Filtered and Acidified		
Copper	<0.02	
Mercury	0.0003	
Lead	<0.010	
Arsenic	0.012	
Selenium	<0.002	
Aluminum	0.18	
Vanadium	0.095	
Strontium	1.1	
Manganese	<0.01	
Iron	0.02	
Lithium	0.05	

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Coal Bean Spring

Submitted 8-4-77
Sampled 8-2-77

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	8
Sodium	120
Calcium	63
Magnesium	108
Sulfate	262
Chloride	8
Carbonate	0
Bicarbonate	738
Total Dissolved Solids, Calculated	933
Total Dissolved Solids @ 180°C	1,017
Standard Deviation of Anion-Cation Balance	0.94 Sigma
Fluoride	0.46
Silica (SiO_2)	18
Nitrate (NO_3)	0.9
Total Phosphorus as P	0.12
Total Hardness as $CaCO_3$	599
Alkalinity as $CaCO_3$	605
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,478 micromhos/cm.
pH	7.6

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	0.03
Mercury	0.0004
Lead	0.011
Arsenic	0.003
Selenium	<0.002
Aluminum	0.21
Vanadium	<0.010
Strontium	2.5
Manganese	0.05
Iron	0.64
Lithium	0.12

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Porcupine Spring

Submitted 8-4-77
Sampled 8-2-77

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	9
Calcium	51
Magnesium	26
Sulfate	14
Chloride	6
Carbonate	0
Bicarbonate	287
Total Dissolved Solids, Calculated	252
Total Dissolved Solids @ 180°C	324
Standard Deviation of Anion-Cation Balance	-0.30 Sigma
Fluoride	1.05
Silica (SiO_2)	28
Nitrate (NO_3^-)	0.8
Total Phosphorus as P	0.13
Total Hardness as $CaCO_3$	235
Alkalinity as $CaCO_3$	235
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	461 micromhos/cm.
pH	8.1
Filtered and Acidified	
Copper	<0.02
Mercury	0.0004
Lead	<0.010
Arsenic	0.008
Selenium	<0.002
Aluminum	0.22
Vanadium	0.056
Strontium	0.94
Manganese	0.07
Iron	0.07
Lithium	0.26

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Black Coyote Spring

Submitted 8-4-77
Sampled 8-2-77 @ 950

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	3
Sodium	8
Calcium	59
Magnesium	12
Sulfate	8
Chloride	5
Carbonate	0
Bicarbonate	238
Total Dissolved Solids, Calculated	212
Total Dissolved Solids @ 180°C	298
Standard Deviation of Anion-Cation Balance	-0.78 Sigma
Fluoride	0.84
Silica (SiO_2)	26
Nitrate (NO_3)	0.9
Total Phosphorus as P	0.09
Total Hardness as $CaCO_3$	196
Alkalinity as $CaCO_3$	195
Non-Carbonate Hardness as $CaCO_3$	1
Conductivity @ 25°C	403 micromhos/cm.

pH ------- 8.0

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	0.02
Mercury	0.0009
Lead	<0.010
Arsenic	0.007
Selenium	<0.002
Aluminum	0.16
Vanadium	0.065
Strontium	0.79
Manganese	0.02
Iron	0.05
Lithium	0.05

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
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PAGE NUMBER
EPA-287 (Cin.)
(4-78)

Black Kettle Spring

Submitted 8-4-77
Sampled 8-2-77 @ 950

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	4
Sodium	9
Calcium	43
Magnesium	25
Sulfate	9
Chloride	6
Carbonate	0
Bicarbonate	256
Total Dissolved Solids, Calculated	222
Total Dissolved Solids @ 180°C	232
Standard Deviation of Anion-Cation Balance	-0.84 Sigma
Fluoride	0.74
Silica (SiO_2)	24
Nitrate (NO_3)	1.7
Total Phosphorus as P	0.20
Total Hardness as $CaCO_3$	210
Alkalinity as $CaCO_3$	210
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	413 micromhos/cm.
pH	7.9
Filtered and Acidified	
Copper	<0.02
Mercury	0.0011
Lead	<0.010
Arsenic	0.007
Selenium	<0.002
Aluminum	0.19
Vanadium	0.054
Strontium	0.84
Manganese	0.03
Iron	0.02
Lithium	0.26

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Rusty Spring

Submitted 8-3-77
Sampled 8-1-77 @ 1505

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	14
Sodium	210
Calcium	126
Magnesium	170
Sulfate	872
Chloride	16
Carbonate	0
Bicarbonate	641
Total Dissolved Solids, Calculated	1,723
Total Dissolved Solids @ 180°C	1,752
Standard Deviation of Anion-Cation Balance	-1.22 Sigma
Fluoride	0.80
Silica (SiO_2)	16
Nitrate (NO_3)	0.5
Total Phosphorus as P	0.08
Total Hardness as $CaCO_3$	1,014
Alkalinity as $CaCO_3$	525
Non-Carbonate Hardness as $CaCO_3$	489
Conductivity @ 25°C	2,304 micromhos/cm.
pH	7.8

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	0.02
Mercury	0.0003
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.13
Vanadium	<0.010
Strontium	3.3
Manganese	<0.01
Iron	0.08
Lithium	0.15

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Sweet Medicine #2, mouth of Sweet Medicine

Temp. 57°F Salinity Conductivity 1490 micromhos/cm.
Field pH 7.6
Submitted 8-3-77
Sampled 8-1-77 @ 1615

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	8
Sodium	80
Calcium	39
Magnesium	58
Sulfate	206
Chloride	8
Carbonate	0
Bicarbonate	366
Total Dissolved Solids, Calculated	579
Total Dissolved Solids @ 180°C	620
Standard Deviation of Anion-Cation Balance	0.34 Sigma
Fluoride	0.84
Silica (SiO_2)	19
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.15
Total Hardness as $CaCO_3$	336
Alkalinity as $CaCO_3$	300
Non-Carbonate Hardness as $CaCO_3$	36
Conductivity @ 25°C	1,469 micromhos/cm.
pH	7.4

Filtered and Acidified

Copper	<0.02
Mercury	0.0002
Lead	<0.010
Arsenic	<0.001
Selenium	<0.002
Aluminum	0.21
Vanadium	<0.010
Strontium	3.0
Manganese	0.02
Iron	0.08
Lithium	0.08

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TOM OF GE AREA; SIDE ENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER
EPA-287 (Cin.) (4-76)

White Antelope Spring

Submitted 8-5-77
Sampled 8-4-77 @ 1730

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	6
Sodium	19
Calcium	51
Magnesium	20
Sulfate	12
Chloride	5
Carbonate	0
Bicarbonate	287
Total Dissolved Solids, Calculated	254
Total Dissolved Solids @ 180°C	287
Standard Deviation of Anion-Cation Balance	-0.58 Sigma
Fluoride	0.86
Silica (SiO_2)	21
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.40
Total Hardness as $CaCO_3$	210
Alkalinity as $CaCO_3$	235
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	480 micromhos/cm.
pH	7.9
Filtered and Acidified	
Copper	0.03
Mercury	0.0007
Lead	<0.010
Arsenic	0.008
Selenium	<0.002
Aluminum	0.21
Vanadium	0.048
Strontium	1.5
Manganese	<0.01
Iron	0.06
Lithium	0.03

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3/8"
BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

Wolf Voice Spring

Submitted 8-5-77
Sampled 8-3-77 @ 1815

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	17
Sodium	80
Calcium	73
Magnesium	60
Sulfate	145
Chloride	8
Carbonate	0
Bicarbonate	549
Total Dissolved Solids, Calculated	653
Total Dissolved Solids @ 180°C	646
Standard Deviation of Anion-Cation Balance	-0.91 Sigma
Fluoride	1.0
Silica (SiO_2)	19
Nitrate (NO_3)	0.4
Total Phosphorus as P	0.67
Total Hardness as $CaCO_3$	429
Alkalinity as $CaCO_3$	450
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,049 micromhos/cm
pH	7.7

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	0.0008
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.09
Vanadium	<0.010
Strontium	1.9
Manganese	0.02
Iron	0.55
Lithium	0.08

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Spang Spring-Spang, NE ¼ NW ¼ Sec.28 T3S-R42E

Temp. 19.0°C Salinity 0.5% Conductivity 770 micromhos/cm.

Field pH 8.4

Submitted 8-5-77

Sampled 8-4-77 @ 1700

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	7
Sodium	90
Calcium	39
Magnesium	43
Sulfate	87
Chloride	8
Carbonate	12
Bicarbonate	427
Total Dissolved Solids, Calculated	496
Total Dissolved Solids @ 180°C	517
Standard Deviation of Anion-Cation Balance	-0.47 Sigma
Fluoride	0.72
Silica (SiO_2)	7
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.07
Total Hardness as $CaCO_3$	273
Alkalinity as $CaCO_3$	370
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	843 micromhos/cm
pH	8.3
Filtered and Acidified	
Copper	<0.02
Mercury	<0.0002
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.22
Vanadium	<0.010
Strontium	0.84
Manganese	0.03
Iron	0.13
Lithium	0.05

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Three Bears Spring

Submitted 8-9-77
Sampled 8-5-77

CONSTITUENT	**PARTS PER MILLION**
Filtered Only	
Potassium	6
Sodium	20
Calcium	106
Magnesium	77
Sulfate	235
Chloride	8
Carbonate	0
Bicarbonate	476
Total Dissolved Solids, Calculated	686
Total Dissolved Solids @ 180°C	718
Standard Deviation of Anion-Cation Balance	0.90 Sigma
Fluoride	0.58
Silica (SiO_2)	20
Nitrate (NO_3)	3.0
Total Phosphorus as P	0.13
Total Hardness as $CaCO_3$	581
Alkalinity as $CaCO_3$	390
Non-Carbonate Hardness as $CaCO_3$	191
Conductivity @ 25°C	1,094 micromhos/cm.
pH	7.9
Filtered and Acidified	
Copper	0.03
Mercury	<0.0002
Lead	<0.010
Arsenic	0.003
Selenium	<0.002
Aluminum	0.29
Vanadium	0.014
Strontium	1.1
Manganese	0.13
Iron	0.04
Lithium	0.03

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Red Bird Spring

Submitted 8-5-77
Sampled 8-3-77 @ 1055

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	10
Sodium	60
Calcium	193
Magnesium	102
Sulfate	374
Chloride	8
Carbonate	0
Bicarbonate	756
Total Dissolved Solids, Calculated	1,120
Total Dissolved Solids @ 180°C	1,138
Standard Deviation of Anion-Cation Balance	-1.08 Sigma
Fluoride	0.18
Silica (SiO_2)	14
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.07
Total Hardness as $CaCO_3$	899
Alkalinity as $CaCO_3$	620
Non-Carbonate Hardness as $CaCO_3$	279
Conductivity @ 25°C	1,578 micromhos/cm.
pH	7.5

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	0.0011
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.23
Vanadium	<0.010
Strontium	7.3
Manganese	0.26
Iron	3.4
Lithium	0.16

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Birdseye Spring

Temp. 10.5°C Salinity Conductivity micromhos/cm.
Field pH 7.5
Submitted 8-5-77
Sampled 8-4-77 @ 1045

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	17
Sodium	50
Calcium	99
Magnesium	113
Sulfate	291
Chloride	8
Carbonate	0
Bicarbonate	610
Total Dissolved Solids, Calculated	878
Total Dissolved Solids @ 180°C	915
Standard Deviation of Anion-Cation Balance	-1.56 Sigma
Fluoride	0.52
Silica (SiO_2)	15
Nitrate (NO_3)	1.0
Total Phosphorus as P	0.33
Total Hardness as $CaCO_3$	712
Alkalinity as $CaCO_3$	500
Non-Carbonate Hardness as $CaCO_3$	212
Conductivity @ 25°C	1,313 micromhos/cm.
pH	7.7

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	<0.0002
Lead	<0.010
Arsenic	<0.001
Selenium	<0.002
Aluminum	0.20
Vanadium	<0.010
Strontium	1.7
Manganese	0.03
Iron	0.07
Lithium	0.08

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TOM OF GE AREA; SIDE ENSION TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Black Wolf Spring

Submitted 8-9-77
Sampled 8-5-77

CONSTITUENT	**PARTS PER MILLION**
Filtered Only	
Potassium	8
Sodium	30
Calcium	122
Magnesium	142
Sulfate	337
Chloride	11
Carbonate	72
Bicarbonate	561
Total Dissolved Solids, Calculated	998
Total Dissolved Solids @ 180°C	956
Standard Deviation of Anion-Cation Balance	-0.84 Sigma
Fluoride	0.70
Silica (SiO_2)	21
Nitrate (NO_3)	4.8
Total Phosphorus as P	0.06
Total Hardness as $CaCO_3$	887
Alkalinity as $CaCO_3$	580
Non-Carbonate Hardness as $CaCO_3$	307
Conductivity @ 25°C	1,488 micromhos/cm.
pH ------- 8.3	
Filtered and Acidified	
Copper	0.03
Mercury	0.0013
Lead	<0.010
Arsenic	0.004
Selenium	<0.002
Aluminum	0.35
Vanadium	0.019
Strontium	1.18
Manganese	0.05
Iron	0.19
Lithium	0.05

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Hardrobe Spring

Submitted 8-5-77
Sampled 8-4-77 @ 1700

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	17
Sodium	60
Calcium	71
Magnesium	111
Sulfate	240
Chloride	9
Carbonate	42
Bicarbonate	573
Total Dissolved Solids, Calculated	832
Total Dissolved Solids @ 180°C	826
Standard Deviation of Anion-Cation Balance	0.90 Sigma
Fluoride	1.0
Silica (SiO_2)	14
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.07
Total Hardness as $CaCO_3$	633
Alkalinity as $CaCO_3$	540
Non-Carbonate Hardness as $CaCO_3$	93
Conductivity @ 25°C	1,313 micromhos/cm
pH	8.4
Filtered and Acidified	
Copper	<0.02
Mercury	0.0014
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.28
Vanadium	<0.010
Strontium	1.3
Manganese	0.02
Iron	0.04
Lithium	0.08

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Maehoo Spring

Submitted 8-5-77
Sampled 8-3-77 @ 500

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	11
Sodium	50
Calcium	124
Magnesium	70
Sulfate	200
Chloride	7
Carbonate	0
Bicarbonate	592
Total Dissolved Solids, Calculated	753
Total Dissolved Solids @ 180°C	738
Standard Deviation of Anion-Cation Balance	-0.99 Sigma
Fluoride	0.36
Silica (SiO_2)	12
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.07
Total Hardness as $CaCO_3$	596
Alkalinity as $CaCO_3$	485
Non-Carbonate Hardness as $CaCO_3$	111
Conductivity @ 25°C	1,156 micromhos/cm.

pH ------- 7.2

Filtered and Acidified

Copper	<0.02
Mercury	0.0003
Lead	<0.010
Arsenic	<0.001
Selenium	<0.002
Aluminum	0.20
Vanadium	<0.010
Strontium	1.9
Manganese	0.11
Iron	1.2
Lithium	0.08

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Box Elder Spring

Submitted 8-5-77
Sampled 8-3-77 @ 1830

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	13
Sodium	30
Calcium	100
Magnesium	74
Sulfate	196
Chloride	5
Carbonate	0
Bicarbonate	512
Total Dissolved Solids, Calculated	670
Total Dissolved Solids @ 180°C	705
Standard Deviation of Anion-Cation Balance	-0.52 Sigma
Fluoride	0.25
Silica (SiO_2)	17
Nitrate (NO_3)	0.1
Total Phosphorus as P	0.02
Total Hardness as $CaCO_3$	556
Alkalinity as $CaCO_3$	420
Non-Carbonate Hardness as $CaCO_3$	136
Conductivity @ 25°C	1,058 micromhos/cm
pH ------- 8.1	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0013
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.18
Vanadium	<0.010
Strontium	1.1
Manganese	0.05
Iron	0.03
Lithium	0.05

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3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

Bixby Spring

Submitted 8-5-77
Sampled 8-3-77 @ 915

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	7
Sodium	17
Calcium	61
Magnesium	46
Sulfate	100
Chloride	8
Carbonate	0
Bicarbonate	323
Total Dissolved Solids, Calculated	398
Total Dissolved Solids @ 180°C	458
Standard Deviation of Anion-Cation Balance	-0.64Sigma
Fluoride	1.3
Silica (SiO_2)	22
Nitrate (NO_3)	2.6
Total Phosphorus as P	0.13
Total Hardness as $CaCO_3$	342
Alkalinity as $CaCO_3$	265
Non-Carbonate Hardness as $CaCO_3$	77
Conductivity @ 25°C	686 micromhos/cm.
pH	7.6
Filtered and Acidified	
Copper	<0.02
Mercury	0.0002
Lead	<0.010
Arsenic	0.010
Selenium	<0.002
Aluminum	0.16
Vanadium	0.150
Strontium	1.7
Manganese	0.10
Iron	0.50
Lithium	0.05

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BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"
PAGE NUMBER
EPA-287 (Cin.)
(4-76)

Oldbear Spring

Submitted 8-5-[illegible]7
Sampled 8-3-77 @ 1015

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	28
Calcium	63
Magnesium	44
Sulfate	90
Chloride	6
Carbonate	0
Bicarbonate	390
Total Dissolved Solids, Calculated	429
Total Dissolved Solids @ 180°C	451
Standard Deviation of Anion-Cation Balance	1.37 Sigma
Fluoride	0.80
Silica (SiO_2)	20
Nitrate (NO_3)	0.4
Total Phosphorus as P	0.15
Total Hardness as $CaCO_3$	337
Alkalinity as $CaCO_3$	320
Non-Carbonate Hardness as $CaCO_3$	17
Conductivity @ 25°C	761 micromhos/cm.
pH	7.8
Filtered and Acidified	
Copper	<0.02
Mercury	<0.0002
Lead	<0.010
Arsenic	0.004
Selenium	<0.002
Aluminum	0.16
Vanadium	0.057
Strontium	1.8
Manganese	0.01
Iron	0.04
Lithium	0.05

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3/8"
BOTTOM OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

PAGE NUMBER
EPA-287 (Cin.)
(4-76)

B. Hart Spring

Submitted 8-4-77
Sampled 8-2-77 @ 1100

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	9
Sodium	110
Calcium	47
Magnesium	53
Sulfate	182
Chloride	11
Carbonate	0
Bicarbonate	439
Total Dissolved Solids, Calculated	628
Total Dissolved Solids @ 180°C	664
Standard Deviation of Anion-Cation Balance	-1.60 Sigma
Fluoride	1.7
Silica (SiO_2)	29
Nitrate (NO_3)	0.68
Total Phosphorus as P	0.15
Total Hardness as $CaCO_3$	336
Alkalinity as $CaCO_3$	360
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	922 micromhos cm.
pH ------- 8.2	-
Filtered and Acidified	
Copper	0.03
Mercury	0.0001
Lead	<0.010
Arsenic	0.017
Selenium	<0.002
Aluminum	0.17
Vanadium	0.186
Strontium	0.76
Manganese	<0.01
Iron	0.02
Lithium	0.11

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

White Frog Spring

Submitted 8-4-77
Sampled 8-2-77 @ 1400

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	9
Sodium	86
Calcium	47
Magnesium	35
Sulfate	157
Chloride	6
Carbonate	24
Bicarbonate	317
Total Dissolved Solids, Calculated	520
Total Dissolved Solids @ 180°C	582
Standard Deviation of Anion-Cation Balance	0.76 Sigma
Fluoride	0.96
Silica (SiO_2)	15
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.18
Total Hardness as $CaCO_3$	264
Alkalinity as $CaCO_3$	300
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	883 micromhos/cm.
pH	8.5

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	0.0003
Lead	<0.010
Arsenic	0.005
Selenium	<0.002
Aluminum	0.06
Vanadium	0.052
Strontium	1.08
Manganese	0.02
Iron	0.04
Lithium	0.05

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OF IMAGE AREA OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Yellow Nose Spring

Submitted 8-4-77
Sampled 8-2-77 @ 1500

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	8
Sodium	180
Calcium	59
Magnesium	61
Sulfate	239
Chloride	7
Carbonate	36
Bicarbonate	622
Total Dissolved Solids, Calculated	896
Total Dissolved Solids @ 180°C	993
Standard Deviation of Anion-Cation Balance	1.46 Sigma
Fluoride	0.60
Silica (SiO_2)	12
Nitrate (NO_3)	0.7
Total Phosphorus as P	0.05
Total Hardness as $CaCO_3$	400
Alkalinity as $CaCO_3$	570
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,440 micromhos/cm.
pH	8.3
Filtered and Acidified	
Copper	<0.02
Mercury	0.0004
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.16
Vanadium	0.142
Strontium	1.7
Manganese	0.06
Iron	0.13
Lithium	0.14

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BOTTOM OF IMAGE AREA: OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Station Spring, SE ¼ NE ¼Sec. 4-T4S-R42E, Lost Leg

Temp. 11°C Salinity Conductivity 317 micromhos/cm.

Field pH 7.9

Submitted 8-4-77

Sampled 8-2-77 @ 930

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	20
Calcium	39
Magnesium	19
Sulfate	31
Chloride	5
Carbonate	0
Bicarbonate	232
Total Dissolved Solids, Calculated	233
Total Dissolved Solids @ 180°C	276
Standard Deviation of Anion-Cation Balance	0.36 Sigma
Fluoride	1.4
Silica (SiO_2)	20
Nitrate (NO_3)	2.1
Total Phosphorus as P	0.04
Total Hardness as $CaCO_3$	176
Alkalinity as $CaCO_3$	190
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	451 micromhos/cm.
pH	7.8
Filtered and Acidified	
Copper	<0.02
Mercury	0.0006
Lead	<0.010
Arsenic	0.015
Selenium	<0.002
Aluminum	0.16
Vanadium	0.164
Strontium	1.3
Manganese	0.05
Iron	0.20
Lithium	0.05

(< is less than)

EPA-287 (Cin.)
(4-76)

Wolf Tooth Spring

Temp. 11.0°C Salinity 0.5 Conductivity 780 micromhos/c

Field pH 7.2
Submitted 8-5-77
Sampled 8-3-77 @ 1700

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	15
Sodium	80
Calcium	71
Magnesium	52
Sulfate	108
Chloride	9
Carbonate	0
Bicarbonate	561
Total Dissolved Solids, Calculated	611
Total Dissolved Solids @ 180°C	636
Standard Deviation of Anion-Cation Balance	0.06 Sigma
Fluoride	1.2
Silica (SiO_2)	20
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.15
Total Hardness as $CaCO_3$	391
Alkalinity as $CaCO_3$	460
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,078 micromhos/cm
pH	7.4

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	0.0020
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.09
Vanadium	0.045
Strontium	1.4
Manganese	0.07
Iron	0.80
Lithium	0.05

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Elliott Springs, NE ¼ NE ¼ Sec.20 T4S-R42E, Birney

Temp. 15°C Salinity Conductivity 450 micromhos/cm.

Field pH 8.4
Submitted 8-5-77
Sampled 8-4-77 @ 1545

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	39
Calcium	67
Magnesium	32
Sulfate	52
Chloride	7
Carbonate	0
Bicarbonate	390
Total Dissolved Solids, Calculated	394
Total Dissolved Solids @ 180°C	427
Standard Deviation of Anion-Cation Balance	-0.51 Sigma
Fluoride	0.96
Silica (SiO_2)	20
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.04
Total Hardness as $CaCO_3$	298
Alkalinity as $CaCO_3$	320
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	686 micromhos/cm.
pH	8.1
Filtered and Acidified	
Copper	<0.02
Mercury	0.0013
Lead	0.012
Arsenic	0.001
Selenium	<0.002
Aluminum	0.19
Vanadium	<0.010
Strontium	0.82
Manganese	0.02
Iron	0.02
Lithium	0.04

(< is less than)

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3/8"
PAGE NUMBER
EPA-287 (Cin.) (4-76)

Black Bird Spring

Temp. 20.0°C Salinity 1.3 Conductivity 1,730 micromhos/cm.

Field pH 7.4

Submitted 8-5-77

Sampled 8-3-77 @ 1600

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	17
Sodium	500
Calcium	16
Magnesium	14
Sulfate	232
Chloride	12
Carbonate	0
Bicarbonate	1,159
Total Dissolved Solids, Calculated	1,362
Total Dissolved Solids @ 180°C	1,386
Standard Deviation of Anion-Cation Balance	0.06 Sigma
Fluoride	12.0
Silica (SiO_2)	9
Nitrate (NO_3)	1.0
Total Phosphorus as P	0.18
Total Hardness as $CaCO_3$	98
Alkalinity as $CaCO_3$	950
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	2,185 micromhos/cm.
pH ------- 7.7	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0012
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.27
Vanadium	<0.010
Strontium	0.89
Manganese	0.03
Iron	0.10
Lithium	0.11

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Killsnight Spring

Temp.25°C Salinity Conductivity 1,010 micromhos/cm.

Field pH 7.84
Submitted 8-5-77
Sampled 8-3-77 @ 345

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	1
Sodium	80
Calcium	102
Magnesium	47
Sulfate	170
Chloride	6
Carbonate	0
Bicarbonate	525
Total Dissolved Solids, Calculated	664
Total Dissolved Solids @ 180°C	681
Standard Deviation of Anion-Cation Balance	-0.64 Sigma
Fluoride	0.56
Silica (SiO_2)	17
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.07
Total Hardness as CaCO	450
Alkalinity as $CaCO_3$	430
Non-Carbonate Hardness as $CaCO_3$	20
Conductivity @ 25°C	1,058 micromhos/cm.
pH	8.0

Filtered and Acidified

Copper	<0.02
Mercury	0.0015
Lead	<0.010
Arsenic	0.002
Selenium	<0.002
Aluminum	0.53
Vanadium	<0.010
Strontium	1.4
Manganese	0.35
Iron	0.06
Lithium	0.08

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EPA-287 (Cin.)
(4-76)

Cut Nose Spring

Temp.11.2°C Salinity Conductivity 960 micromhos/cm.
Field pH 6.64
Submitted 8-5-77
Sampled 8-3-77 @ 420

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	5
Sodium	30
Calcium	106
Magnesium	48
Sulfate	133
Chloride	6
Carbonate	0
Bicarbonate	476
Total Dissolved Solids, Calculated	562
Total Dissolved Solids @ 180°C	580
Standard Deviation of Anion-Cation Balance	0.00 Sigma
Fluoride	0.37
Silica (SiO_2)	12
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.08
Total Hardness as $CaCO_3$	464
Alkalinity as $CaCO_3$	390
Non-Carbonate Hardness as $CaCO_3$	74
Conductivity @ 25°C	951 micromhos/cm.
pH ------- 7.2	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0003
Lead	<0.010
Arsenic	0.003
Selenium	<0.002
Aluminum	0.20
Vanadium	<0.010
Strontium	1.4
Manganese	0.29
Iron	1.9
Lithium	0.05

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3/8"
BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS

EPA-287 (Cin.)
(4-76)

Heneoxaa Keta Spring

Temp. 10.5°C Salinity Conductivity 1,500 micromhos/cm.

Field pH 6.8

Submitted 8-5-77

Sampled 8-3-77 @ 125

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	15
Sodium	140
Calcium	108
Magnesium	48
Sulfate	270
Chloride	5
Carbonate	0
Bicarbonate	598
Total Dissolved Solids, Calculated	880
Total Dissolved Solids @ 180°C	895
Standard Deviation of Anion-Cation Balance	-0.88 Sigma
Fluoride	0.27
Silica (SiO_2)	13
Nitrate (NO_3)	1.1
Total Phosphorus as P	0.03
Total Hardness as $CaCO_3$	469
Alkalinity as $CaCO_3$	490
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,372 micromhos/cm
pH	7.4
Filtered and Acidified	
Copper	<0.02
Mercury	0.0014
Lead	<0.010
Arsenic	<0.001
Selenium	<0.002
Aluminum	0.22
Vanadium	<0.010
Strontium	2.4
Manganese	0.13
Iron	0.30
Lithium	0.09

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BOTTOM OF IMAGE AREA. OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
PAGE NUMBER

EPA-287 (Cin.)
(4-76)

White Bull Spring

Temp. 14.0°C Salinity Conductivity micromhos/cm.

Field pH 7.40
Submitted 8-5-77
Sampled 8-3-77 @ 1140

Filtered Only

CONSTITUENT	PARTS PER MILLION
Potassium	4
Sodium	16
Calcium	83
Magnesium	63
Sulfate	100
Chloride	7
Carbonate	0
Bicarbonate	476
Total Dissolved Solids, Calculated	507
Total Dissolved Solids @ 180°C	567
Standard Deviation of Anion-Cation Balance	0.00 Sigma
Fluoride	0.28
Silica (SiO_2)	14
Nitrate (NO_3)	3.0
Total Phosphorus as P	0.04
Total Hardness as $CaCO_3$	464
Alkalinity as $CaCO_3$	390
Non-Carbonate Hardness as $CaCO_3$	74
Conductivity @ 25°C	941 micromhos/cm
pH	7.6

Filtered and Acidified

CONSTITUENT	PARTS PER MILLION
Copper	<0.02
Mercury	0.0015
Lead	<0.010
Arsenic	0.001
Selenium	<0.002
Aluminum	0.23
Vanadium	<0.010
Strontium	0.9
Manganese	0.01
Iron	0.04
Lithium	0.03

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BOTTOM OF IMAGE AREA; OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
(4-76)

Black Eagle Spring

Field pH 8.5
Submitted 8-5-77
Sampled 8-3-77 @ 1300

CONSTITUENT	PARTS PER MILLION
Filtered Only	
Potassium	19
Sodium	130
Calcium	61
Magnesium	65
Sulfate	194
Chloride	8
Carbonate	0
Bicarbonate	634
Total Dissolved Solids, Calculated	789
Total Dissolved Solids @ 180°C	766
Standard Deviation of Anion-Cation Balance	0.40 Sigma
Fluoride	1.1
Silica (SiO_2)	17
Nitrate (NO_3)	<0.1
Total Phosphorus as P	0.04
Total Hardness as $CaCO_3$	419
Alkalinity as $CaCO_3$	520
Non-Carbonate Hardness as $CaCO_3$	0
Conductivity @ 25°C	1,254 micromhos/cm.
pH ------- 8.1	
Filtered and Acidified	
Copper	<0.02
Mercury	0.0004
Lead	<0.010
Arsenic	0.002
Selenium	0.002
Aluminum	0.23
Vanadium	<0.010
Strontium	1.2
Manganese	0.04
Iron	0.16
Lithium	0.08

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BOTTOM OF IMAGE AREA, OUTSIDE DIMENSION FOR TABLES AND ILLUSTRATIONS
3/8"

EPA-287 (Cin.)
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ANALYTICAL METHODS USED BY ENERGY AND ENVIRONMENTAL RESOURCE CONSULTANTS, INC., IN THE PERFORMANCE OF WATER ANALYSES WORK UNDER EPA GRANT #R806082

(a)

CONSTITUENT	METHOD	DETECTION LIMIT mg./l.
Potassium	EPA* page 143	0.002
Sodium	EPA page 141	0.005
Calcium	Std. Methods**	
	page 189 306C	1
	EPA page 103	0.01
Magnesium	Std. Methods	
	page 223 313 C	1
	EPA page 115	0.001
Sulfate	Std. Methods	
	gravimetric	15
	page 495 427 B	
	turbidimetric	2
Chloride	Std. Methods	
	Argentometric	1
	page 303 408 A	
	Mercurimetric	0.1
Carbonate	Std. Methods	1
	page 102	
Bicarbonate	Std. Methods	1
	page 102	
Total Dissolved Solids	EPA page 266	10
Fluoride	EPA page 65	0.05
Silica (SiO_2)	Std. Methods	
	page 487	1
Nitrate	EPA page 201	0.1 as NO_3
		0.02 NO_3(N)
Total Phosphorus as P	EPA page 249	0.01

*EPA refers to Manual of Methods for Chemical Examinations of Water and Wastes, 625-6-74-003

**Std. Methods refers to Standard Methods for the Examination of Water and Waste Water, 14th Edition.

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ANALYTICAL METHODS, CONTINUED

(b)

CONSTITUENT	METHODS	DETECTION LIMIT mg./l.
Total Hardness as $CaCO_3$	Std. Methods** page 103	1
Alkalinity as $CaCO_3$	Std. Methods page 102	2
Non-carbonate Hardness as $CaCO_3$	Std. Methods page 201	1
Copper	EPA* page 108	0.02
Mercury	EPA page 118	0.0002
Lead	EPA page 112	0.01
Arsenic	EPA page 95	0.002
Selenium	EPA page 145	0.002
Aluminum	EPA page 92	0.05
Vanadium	EPA page 153	0.002
Strontium	Std. Methods page 257	0.01
Manganese	EPA page 116	0.01
Iron	EPA page 110	0.01
Lithium	Std. Methods page 219	0.01

*EPA refers to Manual of Methods for Chemical Examinations of Water and Wastes, 625-6-74-003

**Std. Methods refers to Standard Methods for the Examination of Water and Waste Water, 14th Edition

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APPENDIX C

MONTHLY PRECIPITATION ON THE NORTHERN CHEYENNE RESERVATION (centimeters)

Precipitation Station and Elevation in meters	1976												1977											
	Jan	Feb	Mar	Apr	May	Jun	Jl	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jl	Aug	Sep	Oct	Nov	Dec
Lame Deer Divide 1280			0.7	7.8	4.6	14.6	2.4	1.4	1.8		3.0				3.6		6.2	4.8	3.0	2.1	5.1	4.6	1.3	1.5
Kirby 1152			1.4	4.5	3.8	10.9	2.1	0.9	2.0	2.9	2.9	0.9	2.1	1.2	1.5	3.9	8.4						2.6	3.0
Muddy Creek 1152			2.2	10.7	5.4			1.0	1.4	3.8	3.4	0.7	3.5	1.7	5.0			4.3	2.1	2.6	3.6	5.2	2.9	3.4
Lame Deer NOAA 1097	1.2	1.3	0.6	8.5	4.8	13.9	2.6	1.6	1.7	2.7	2.2	0.6	2.1	1.8	3.8	0.6	9.8	3.1	2.3	4.6	3.1	5.3	3.0	1.8
Busby NOAA 1036	0.6	2.0	1.0	5.5	4.4	8.4	3.6	1.4	1.6	2.7	2.3	0.9	2.6	0.5	0.8	0.7	8.8	4.3	1.4	3.0	2.9	2.0	1.8	2.8
TeePee Ranch 914		1.0	0.6	4.4	4.5	10.5	1.2	0.6	1.4	1.6	2.2	1.0	1.2		2.0	0.5		5.9	2.6	2.3	2.8	2.2	1.5	1.6

Precipitation Station	1978												1979											
	Jan	Feb	Mar	Apr	May	Jun	Jl	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jl	Aug	Sep	Oct	Nov	Dec
Lame Deer Divide	1.7	1.88	.51	3.0	22.3	5.1	-	-	7.2	.15	2.67	2.46	.30	2.2	1.0	2.41	4.11	2.41	3.68	1.02	.51	1.20	.51	.64
Kirby	2.03	2.92	.28	4.14	22.8	5.21	2.87	1.02	10.57	.33	3.81	2.82	.89	1.91	.71	5.72	5.21	1.02	2.67	.64	1.27	[illegible]	1.68	.22
Muddy Creek	2.2	-	-	-	-	-	-	-	-	.38	2.38	2.77	.36	1.52	.89	5.00	5.08	.89	5.97	.38	.69	1.65	1.57	.89
Lame Deer NOAA	2.2	1.23	-	2.46	31.6	3.99	6.71	1.07	6.88	.30	4.34	2.16	1.07	2.90	.66	2.36	5.36	2.16	3.00	.78	.86	1.80	1.50	.46
Busby NOAA	2.26	2.06	.94	4.60	20.9	-	2.13	1.19	10.4	.91	2.36	2.16	1.02	1.45	.43	4.22	4.27	6.22	3.35	1.27	.64	1.3	1.32	-
Teepee Ranch	.53	-	-	2.08	-	5.33	4.72	1.83	-	.25	2.54	.51	.13	2.03	.38	2.03	3.20	1.14	4.32	.76	1.14	1.06	1.37	.25

Appendix D

METRIC CONVERSION TABLE

To Convert	Multiply by	To obtain
acre (ac)	0.4047	hectares
foot (ft)	G.3048	meter (m)
mile (mi)	1.609	kilometer (km)
inch (in)	2.54	centimeter (cm)
gallon per minute (gpm)	0.06309	liter per second
cubic feet per second (cfs)	0.0283	cubic meter per second (m^3/sec)
Acre feet (Ac ft)	1230	cubic meters (m^3)
degrees Fahrenheit	5/9 (°F-32)	degrees celcius (°C)

6-1/2"
9-1/8"
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